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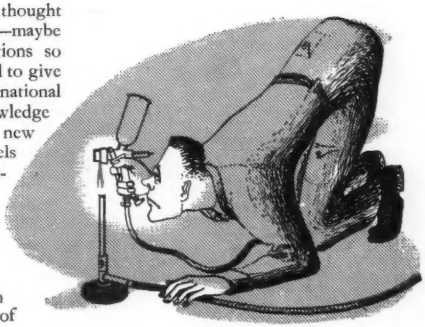

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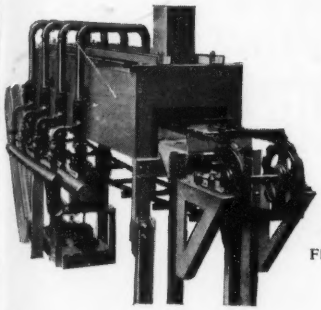

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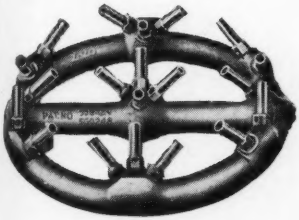

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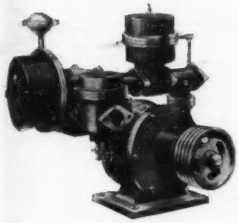

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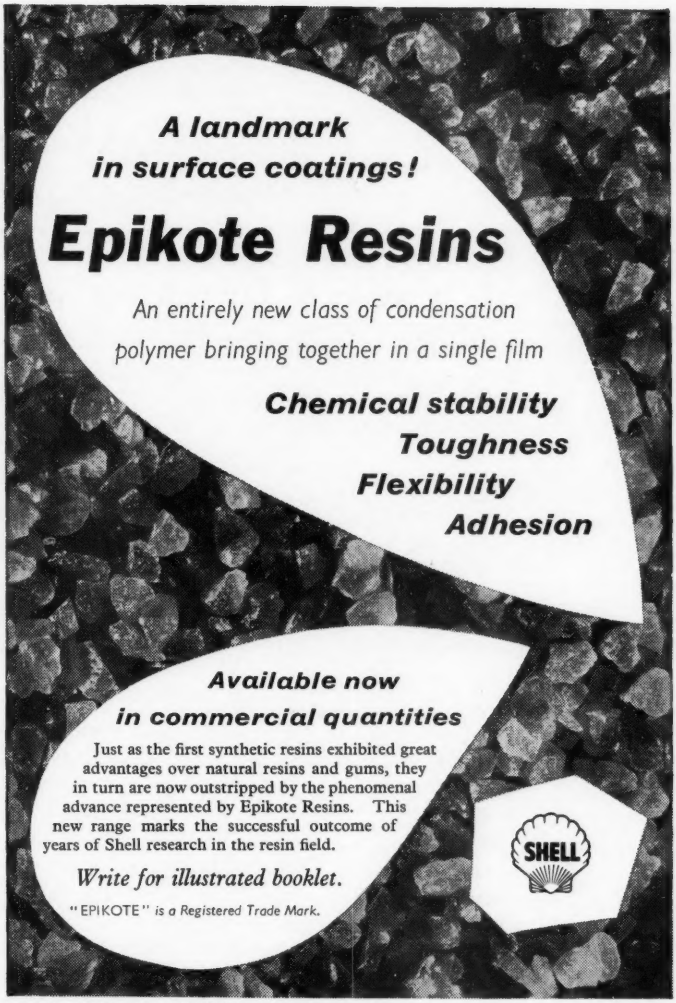
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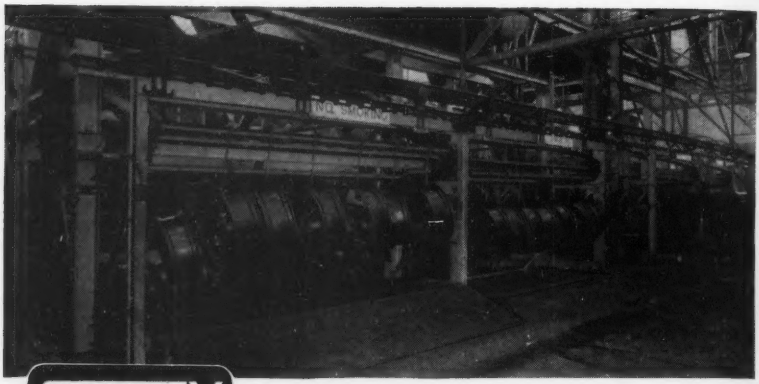

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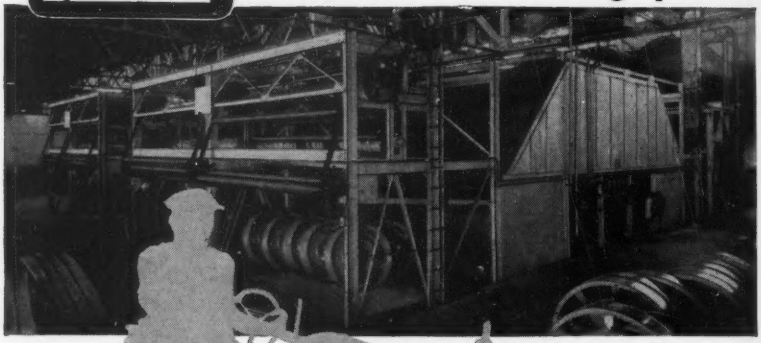

This plant was designed for a fully mechanised dipping and stoving operation for Tractor wheels. Heating is by direct oil firing and the combined crossbar width of the two ovens is 42 ft. The installation included three paint storage tanks of 4,500 gallons capacity and two of 3,500 gallons capacity, together with paint circulating equipment. This is one example of a complete finishing scheme designed and engineered by Stordy . . . equipment is built for the complete cycle in the application of paints, varnishes and all metal finishes including pretreatment and mechanical handling.
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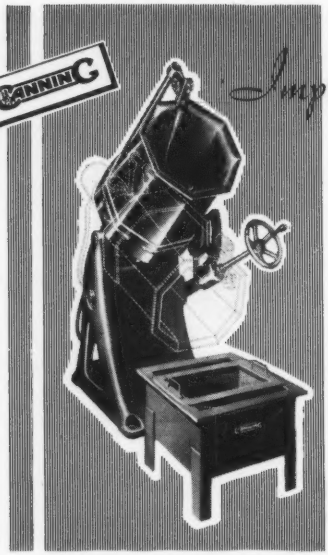

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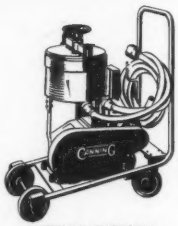

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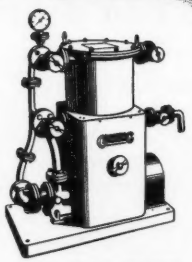

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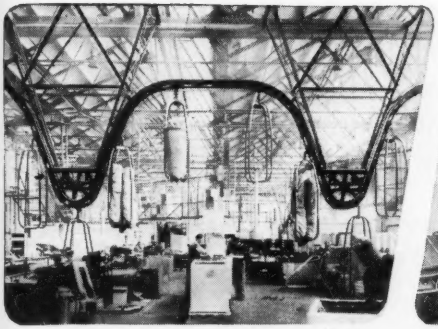
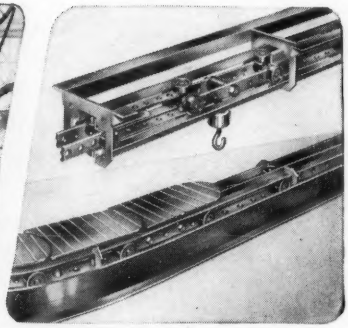
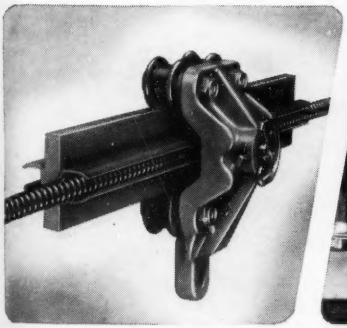
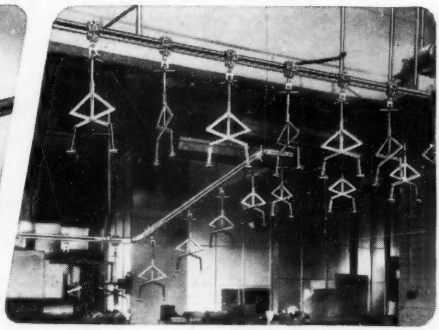




TELEFLEX CONVEYORS



Top left installation photograph by courtesy of the Frigidaire Division of General Motors Ltd.



Lower right installation photograph by courtesy of A. C. Sphinx Sparking Plug Co. Ltd.

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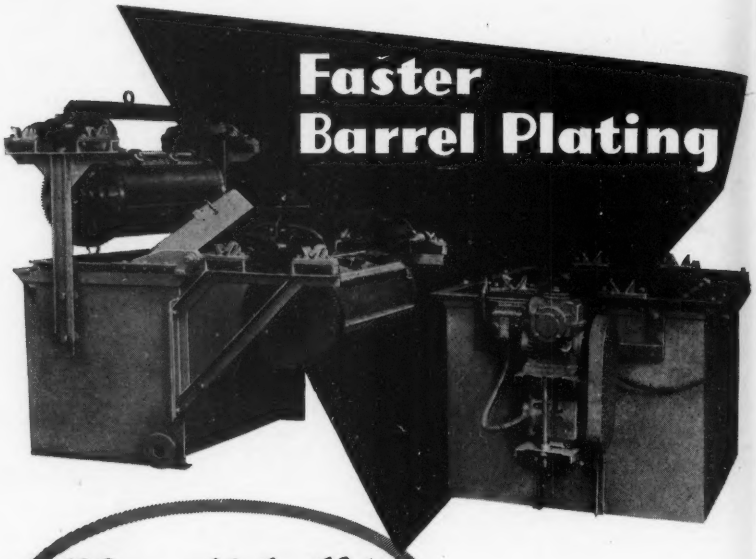

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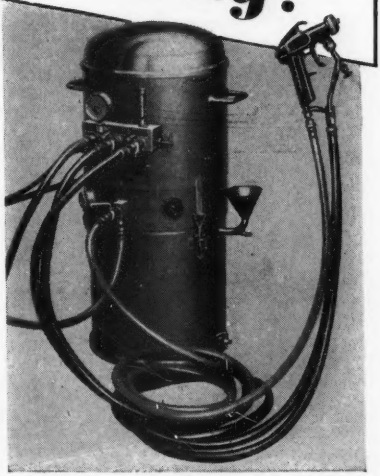

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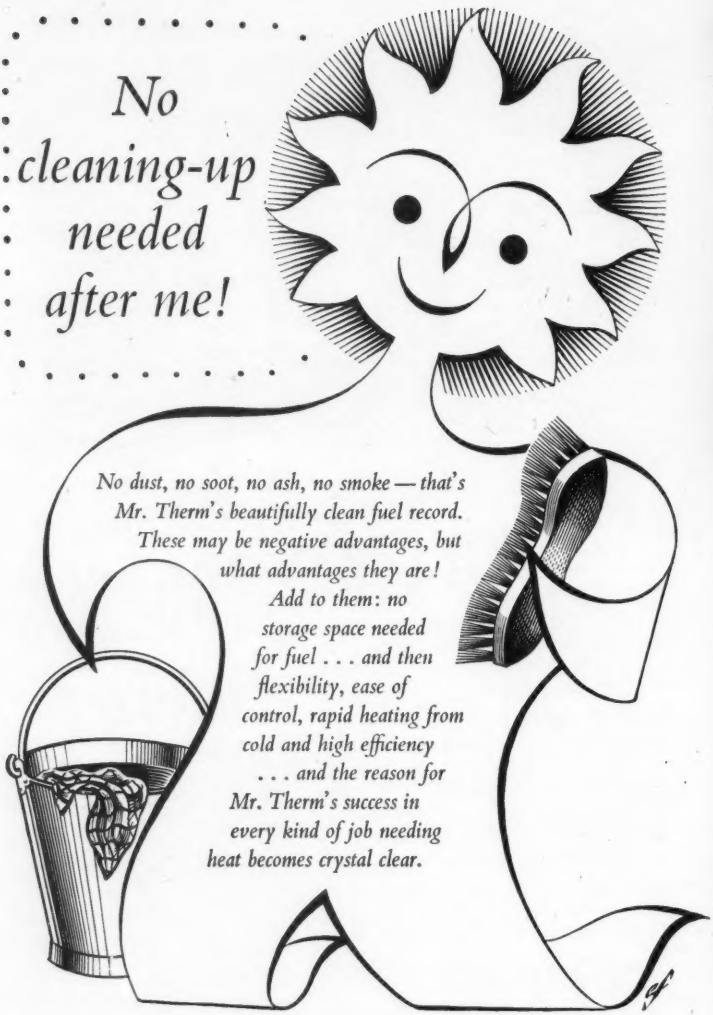

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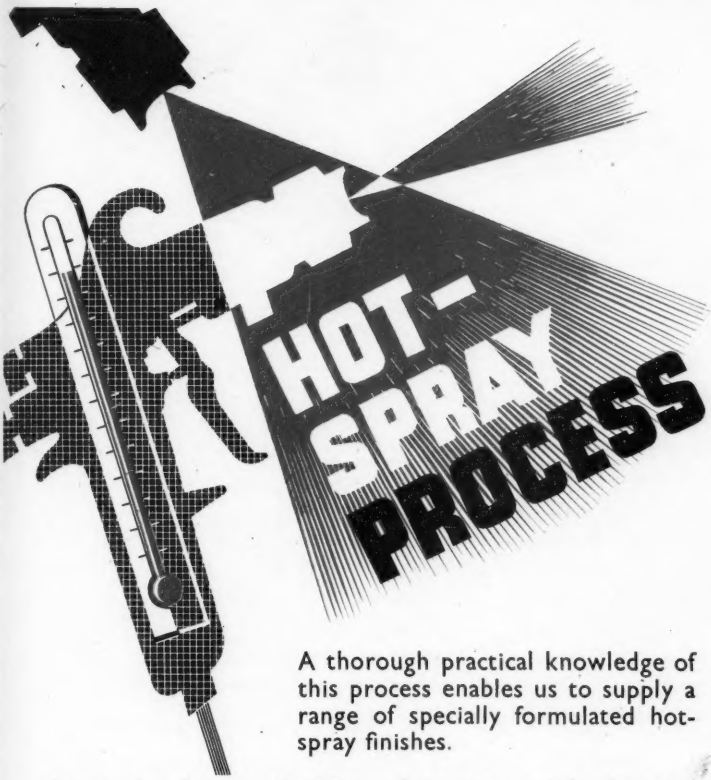

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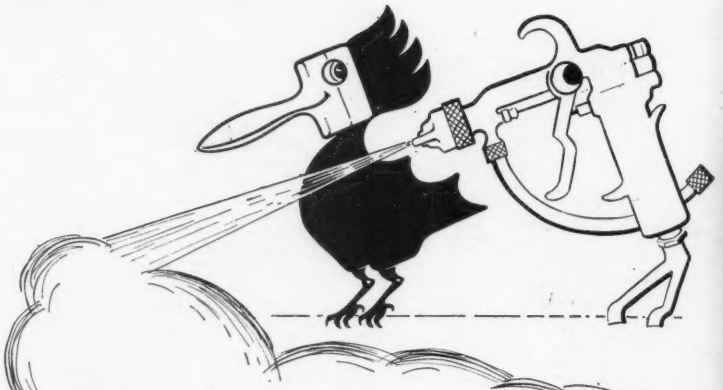

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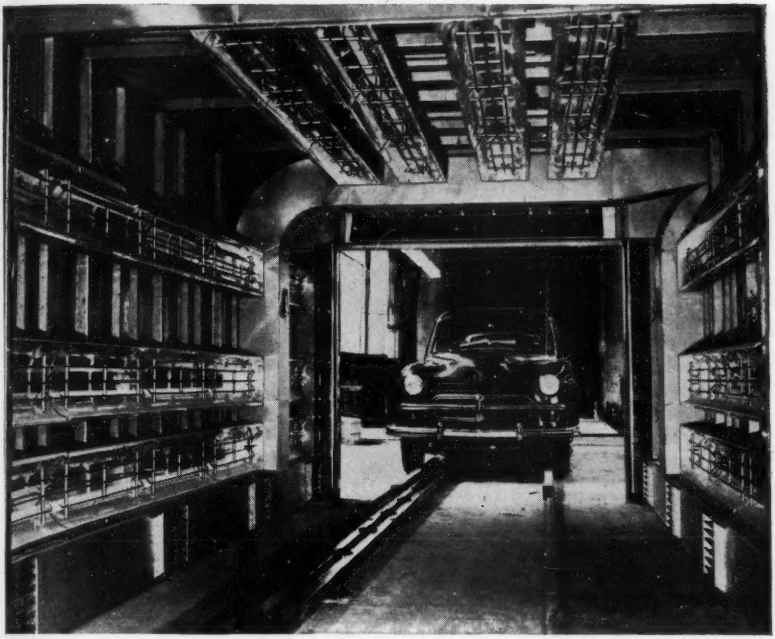

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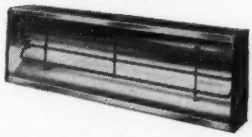

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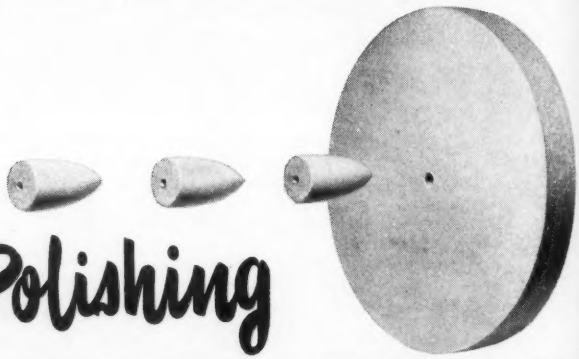

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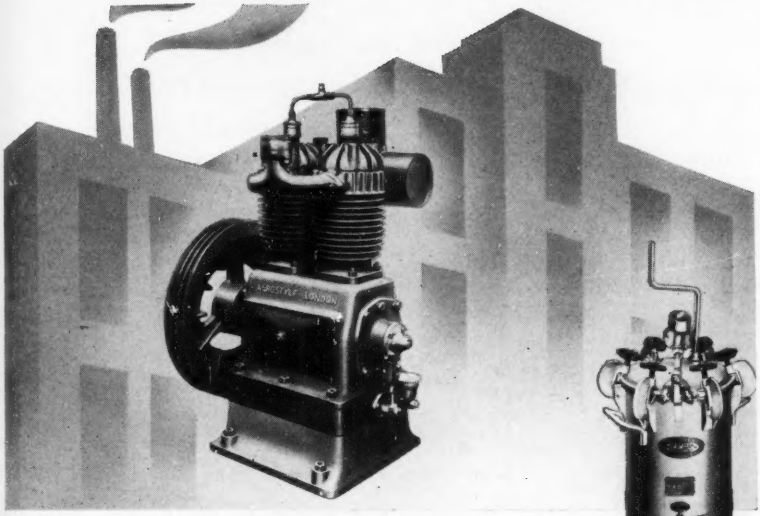

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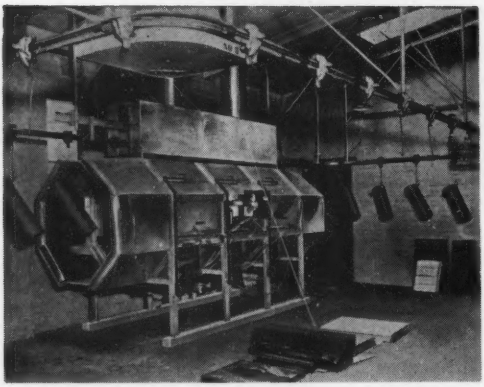

A tunnel of Bratt Colbran Radiant Units stoving finishes on food canisters. (By courtesy of Messrs. Grundy (Teddington) Limited.)

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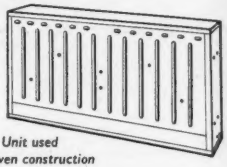

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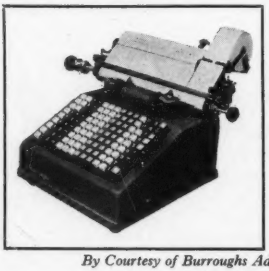

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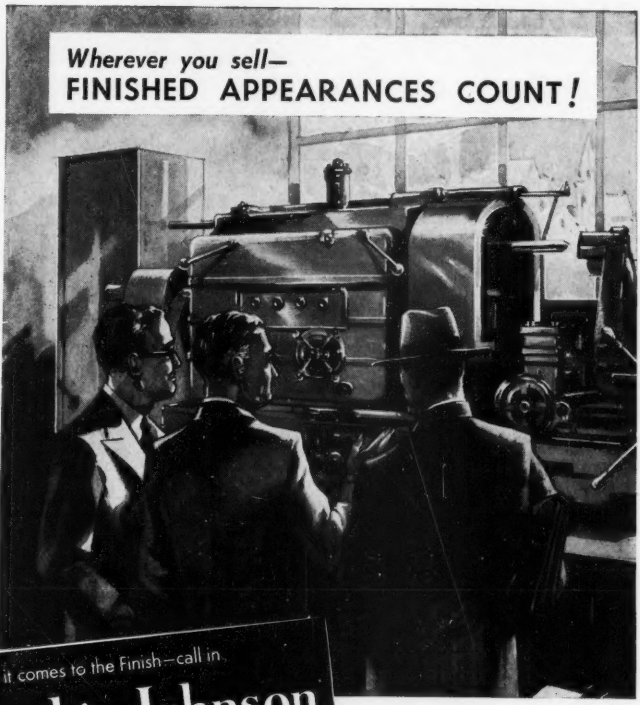

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(Incorporating "CORROSION")

MAY 1953

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Industrial Finishing

VOL. 5 MAY, 1953 NO. 59

DEVOTION

SIGNIFICANCE! That indeed is surely the Coronation theme. Significance of what? That may be the Coronation question.

Yet on Coronation Day all of us will most certainly pay homage to a young woman—a young woman who, at an age when all her contemporaries are doing the things they want, is dedicating her own life, the life of her husband and the lives of her children to what she views as a sacred cause.

She is the focal point, the cynosure and the centre of all eyes—eyes which watch direct by television or indirect through the medium of the cinema. She has to face a ceremony designed for the days when a privileged few were gathered together and act just as confidently before the avid eyes of millions.

In a world torn by dictatorship or, if one likes, democratic republics, she stands as the last of the monarchs holding sway over a powerful state. Republicanism may appear as a delightful philosophy, yet in reality it merely places sovereign power in the hands of a political head.

And, indeed, what are the qualities of a political head? A touch of megalomania, an ability to play to the gallery, a past master at saying "the right thing to the right people at the right time."

What is more, Queen Elizabeth II faces a hostile world. She has to accept the social revolution which has taken place since 1945. She, a woman, has to take up a manly combat and prove that an inherited monarchy is better than a State Head appointed by political expediency. Britain is old in wisdom and Britain alone of the major powers maintains a monarchy. And Britain alone offers to the world a sense of balance and clear thought based on centuries of experience. Old fashioned, maybe! Living in the past, maybe! Yet Britain is progressive in contemporary things like social relations, political consciousness and aircraft design. The newer nations may have need to boast for as yet they have contributed little for posterity.

A Queen! What, indeed, would the "moderns" among the world powers pay for such a privilege as head of their State? Instead they suffer to a greater or lesser extent political oddities thrust into regal prominence.

As publishers of INDUSTRIAL FINISHING, we offer to Her Majesty Queen Elizabeth II our most loyal tribute and devoted thanks for continuing in the footsteps of her father. Likewise to her husband we proffer thanks for his help and encouragement in the wifely tributes of Queenship.

Monarchy may be old-fashioned, but it is dignified—indeed, in this case, doubly dignified by a Queen and a young Queen.

"Long live this Queen!"

I.M.F. SPRING CONFERENCE HARROGATE 1953

THE Annual Spring Conference of the Institute of Metal Finishing at Harrogate from 22nd to 25th April last, must surely rank among the most successful ever held.

A strong technical programme, covering both the non-organic field in which the old E.T.S. specialised and the organic field which is now embraced by the wider scope of the Institute, provided the opportunity for the technically minded members to really get down to business, while the very full and interesting social programme ensured that the ladies, and members who were not interested in the particular subject under discussion, were not left at a loose end but had time for a little relaxation between sessions.

Two variations from the usual programme were the arrangements for a works visit on the Friday afternoon to the works of the British Screw Co. Ltd. at Leeds to see the modern automatic horizontal barrelling plant for zinc plating, and the use of Saturday morning for a full technical session instead of, as is usual, a short demonstration or informal discussion.

The full list of papers and authors was given in our April issue, and it is our intention to deal with these, giving abridged versions of all the

Above: the Mayor of Harrogate, Councillor A. V. Milton, J.P., speaking at the Conference Dinner. Left: the President of the I.M.F., Mr. H. Silman, replying to the toast "The Institute"

papers and full reports of the discussions, in a special Conference number next month. This present report is confined to the business and social side of the Conference.

On the evening of Thursday, 23rd April, the members and guests were entertained by the Mayor and Corporation of Harrogate at a Civic Reception and Dance in the Lounge Hall. The photographs on page 702 were taken at this function and show quite well how the members enjoyed themselves.

The Conference Dinner on the evening of Friday, 24th April, was, of course, the highlight of the Conference. The guests included Sir Ben Lockspeiser, F.R.S., Secretary Department of Scientific and Industrial Research. Mr. W. G. Ibberson, A.M.I.Mech.E., F.I.I.A., President of the Sheffield Chamber of Commerce, Sir Ernest Canning, J.P., and, of course, the Mayor and Lady Mayoress of Harrogate.

It was announced that the Conference next year will be the International Conference on Electrodeposition and Metal Finishing and will be sponsored by the International Council for Electrodeposition. It will take place in or near London and will be held in April. Speculation was strong at Harrogate as to what arrangements will be made for the visitors and guests as the problems of accommodating such a body in or near London are quite serious. Whatever is eventually decided, the general feeling is that it will have to be very good indeed to maintain the standards set by the last few years.

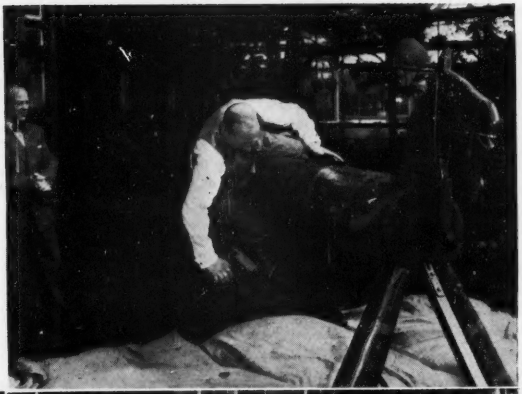
Top right: North Eastern Branch Chairman, Mr. R. W. Nicol, proposing the toast "Mayor and Corporation of Harrogate." Right: Mr. E. A. Ollard, proposing the toast "The Ladies and our Guests"

The Conference provided a number of opportunities for members to enjoy a social "get together." The photographs on the right were taken during the garden fête in the hotel grounds

The photographs on this page were taken at the Civic Reception and Dance given by the Mayor and Corporation in the Harrogate Lounge Hall on the Thursday evening

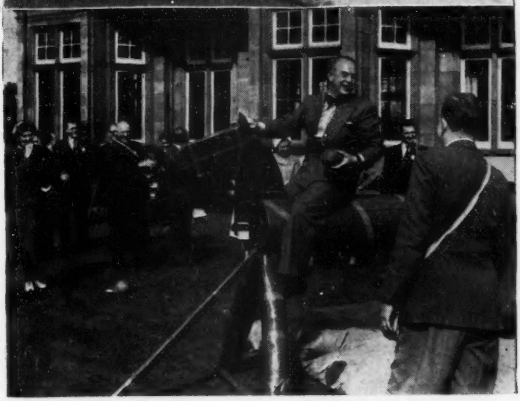
In such a representative gathering it will be surprising if the reader cannot find at least a few familiar faces among these groups

"Let's watch this chap, it should be possible to benefit by the mistakes of others...



... yes, I think I see how it can be done; you stretch out full length ...

a quick jump and the coconut is mine!"



PAINT DIPPING

by FRANK SPICER

COATING of articles with a film of paint by dipping, is surely one of the cheapest and simplest methods of application; there are three main methods of paint dipping as follows:

1. Articles are dipped by hand into a vat of coating material and then hung onto a conveyor which carries them through a stoving oven, drain boards placed in a position beneath the articles prior to their entry into the heating zone, allow the excess paint to drain back into the main tank.

2. A set-up whereby the operator loads the articles to be coated on to a conveyor, via hooks or specially designed jigs, the conveyor is so arranged that the components enter a vat of coating medium and travel a short distance before leaving, and, again passing over a series of drip boards. This second method gives more control than the first, because the rate of withdrawal is determined and constant.

3. The third method is that where the articles are lowered into a tank, and withdrawn at a specified rate, this withdrawal speed is much slower than the two methods previously discussed. But the loss in time is largely made up for by reason that there is little, very often no draining time needed, e.g., paint losses are considerably reduced. The plants for this type of dipping are less costly and are in the main portable. A second version of this type is where the tank of coating medium is raised to the suspended article, and after coating, the tank returns to its normal position, all controls for withdrawal on both machines are entirely hydraulic.

The first method of dipping by hand is being gradually superseded by mechanical methods. Mechanical means of dipping will not only result in greater volume of production, but will produce a more uniform finish. The most widely used is the "low dip" type; the articles are first loaded on to the conveyor, which as can be seen in Fig. 1 enters and leaves the tank automatically.

It is important that all articles are so arranged that all corners are coated, and that excess material can drain off with little difficulty at the lowest edge. To achieve this it is important that careful thought must be given to the design and choice of suspender or carrier. In a job shop, particularly, a large variety of such suspenders must be tailor made, and designed to enable the parts to enter the material at the correct angle for complete coating, and to leave the tank at the most advantageous angle for successful draining.

It is necessary to spend a certain amount of time designing the exact way to hang the job for dipping in order to get an efficient draining. If a pocket of paint has to be left we must arrange that it is the minimum and that it is in some part that does not matter very much.

A slight disadvantage is that many fabricated structures retain pockets of paint in the process of dipping, and for their complete elimination more than one draining angle is required, and that makes the elimination an expensive business. Obviously, if you cannot get rid of your pockets of paint by means of a straightforward jig you have to have some mechanical movement, either rotation or dipping, in order to get rid of them. Sometimes this is done simply by putting a bumper bar under the paint surface, by means of which the work is pulled and turned round in the right angle for dipping.

In order to take full advantage of dipping, before finalising the design of any article it is essential to consider how it will be painted. It is obvious that much good can be done in redesigning an article for a dipping process since dipping is usually a cheaper way of finishing it.

A point to remember is that the

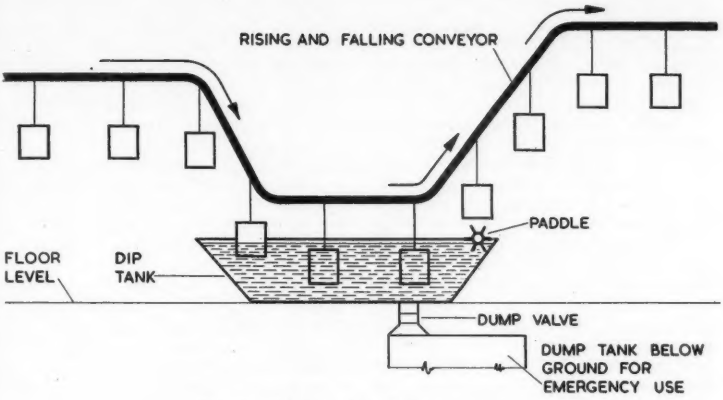


Fig. 1. *Conveyorised dipping system*

majority of racks will only suffice for the job they were designed for, and the storage of these racks presents quite a problem to the small shop. The cost of manufacture of the racks is of course charged for in the original quotation, and it should be pointed out to the customer that, after a certain time, these will be disposed of unless repeat orders are likely to be forthcoming, if a definite time limit is given, a few weeks before it expires, the customer should be notified of the impending disposal of the racks, this may well bring forth a further order, or promise of a future order, in which case it is worth keeping the racks for a further period of time.

Racks used for dipping need stripping quite frequently unless excess loss of paint is to be encountered, the more often they pass through the dipping tank, the larger becomes the area they will drag out; such stripping can be easily and cheaply done using either a proprietary or home-made solution; in the latter case 6 oz./gal. of sodium hydroxide, at near boiling point is quite efficient.

Another important factor in successful dipping is the viscosity of the material, which can only be determined by experiment and constant checking of the deposit thickness after drying, until a satisfactory viscosity has been arrived at. Such consistency should allow maximum drainage on withdrawal, be easily stoved, i.e., not be at all tacky after processing, and afford maximum protection to the coated article.

When the paint is agitated and exposed to air, a certain amount of oxidation takes place. The contents of a dip tank will gradually increase in viscosity partly due to evaporation and partly due to oxidation. The way to watch that is to plot the viscosity curve and the total solids curve. If the two curves remain more or less level, all is proceeding fairly well, but if a level viscosity curve and a falling total solids curve are present, it is evident that something serious is happening to the dip tank.

It means that the user is not putting in enough new paint to make up for the deterioration in the tank itself. This is one of the most important points in the dip tank. It must have the minimum surface area and the minimum volume of paint in the tank to keep the tank working to maximum production, and there must be the maximum input of new paint. In that way, the dip tank can be kept in good condition and will give very little trouble; when tanks get out of hand, however, very little can be done about it.

When a dip tank goes out of action for any reason, it is wise, especially in the case of a very big tank, to make arrangements for dropping the

paint into a separate storage tank where it is out of contact with the air and can be gently agitated. If gentle agitation is applied, paint can be stored in that way for several weeks.

Another feature, often overlooked when installing a dipping plant is, that it is always good policy to "buy big," by which is meant installing a plant that will be capable of handling larger work at a future date, than that for which the plant was originally installed. The extra cost at installation time will be well worth while eventually. Another source of economy for the dipping shop is to maintain the room at an even temperature. This helps in many ways including keeping the consistency of the paint at a constant figure.

Much trouble has been caused in dipping by failure to realise the effect produced by bringing in from outside heavy gauge material and putting it into the dip tank in a cold condition.

One of the troubles which a dipping plant experiences is bubble formation; these bubbles are present when the articles leave the tank and later they burst, leaving an unsightly mark on the painted surface. These bubbles are apparent on the surface of the solution, and are picked up by the articles as they leave, the obvious answer is to keep the bubbles at the entrance end of the tank, where the article enters the coating medium.

To achieve this some mechanical means must be provided. The motion of the articles through the paint will always tend to take them to the exit end. Two main methods are available for keeping the bubbles at the end desired. First a pump may be installed to draw material from the entrance end and feed it back in at the exit end. The return pipe should be placed across the top of the tank. The pipe itself is fitted with a series of nozzles which extend beneath the surface of the coating medium, pointing towards the entrance end of the tank. The material is pumped at a gentle, even rate into the tank setting up a motion which causes the bubbles to flow towards the entrance end, where they either burst or remain.

A second method is to set up a small paddle wheel at the exit end as shown in Fig. 1; this sets up a current to achieve the same purpose.

Where the plant is of the static design, immersion and withdrawal is achieved by hydraulic ram, in which case, after immersion has been completed, the hydraulic oil is allowed to pass back to the supply tank by a special valve which can be set at a rate of from $\frac{1}{4}$ in. to 6 in. per minute. The full value of the slow dip method can be seen from the results in Table 1, obtained by using red lead primer as on Ferguson Radiator Grilles. (See Page 708)

The finishing of broom and mop handles or articles of similar design, such as tubes, still uses a method carried out for many years with little variation, apart from the adoption of mechanical means of immersion and withdrawal. A deep tank is let into the floor, the top of which is covered with a steel disc, into the centre of which is let a washer-shaped rubber gasket, the handles are thrust down through this into the coating medium, and as they are withdrawn, the close fitting squeegee scrapes off excess material. It is important that the material level is kept constant, and this can be easily achieved as shown in Fig. 2.

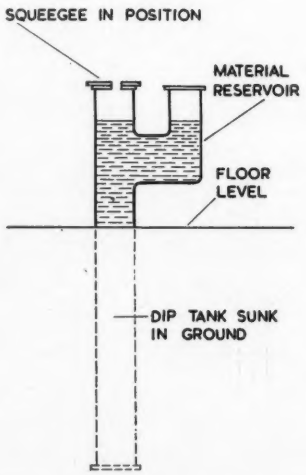


Fig. 2. Reservoir type of tank for broom handle dipping

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TABLE 1

COMPARATIVE TESTS ON SPRAYED AND DIPPED WORK

Test 1. Three sample grilles were subjected to tests as follows:

	Standard Spray	*Plunged Dip*	*Slow Dip*
Thickness	1·2 to 2·0 thou.	0·6 to 3 thou. (Irregular)	1·5 to 3 thou.
Adhesion Scratch	Satisfactory	Satisfactory	Satisfactory
Salt Spray (250 hr.)	Bad rusting and flaking	Rust Patches	Slight rusting

It is concluded that the slow dip gives the best film performance.

Test 2. Test panels were coated with the red primer (as used in works) by the three methods quoted, and submitted to routine tests as below:

Viscosity of primer	25 sec.
Spray	One coat at 45 lb./sq. in. Stoved at 250° F. for 1 hr.
Slow Dip	1 min. withdrawal time 9½ min. drain Stoved at 250° F. for 1 hr.
Plunged Dip	8 min. drain Stoved at 250° F. for 1 hr.

Performance

	Slow Dip	*Plunged Dip*	*Spray*
Thickness	·3 to ·8 thou.	·3 to ·8 thou.	·4 thou.
Mean	·4 thou.	·4 thou.	·4 thou.
Scratch Hardness	1·4 KG	1·2 KG	1·1 KG
Bend Test	Perfect	Perfect	Perfect
Salt Spray Test	Satisfactory after 120 hr.	Large rust patches after 120 hr.	Rust spots after 80 hr. Patches after 120 hr.

These tests confirm that a slow dip gives a film with a better performance than that given by a plunged dip or by normal spraying

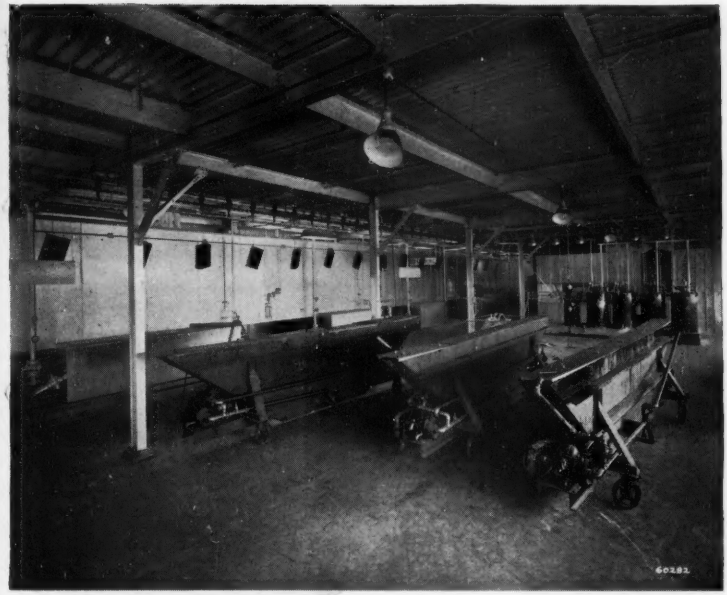


Fig. 3. Dipping installation using wheeled tanks to permit quick change of paint colour

Another disadvantage of dipping, and probably one of the principal ones, is that it is inflexible as regards colour changes.

In Fig. 3 is shown a typical American dipping installation which overcomes this objection. It is spacious and well designed and also well ventilated; in the foreground are three *portable* dipping tanks, each containing a different colour; these can be easily *wheeled* into position in the dipping line as desired. Note the pumps at the end of the tank and the return pipe running along the side of the tank for feeding the material back in at the opposite end.

Fire is a hazard which faces all paint finishing systems including the dipping processes, and it is advisable to be wise before the event. Many preventative systems are available for putting out dip tank fires, within seconds of their start.

Heat sensitive actuators; these are placed around the heat-sensitive lip of the tank, and also placed around the inside lip of the tank is a pipe fitted with nozzles. This pipe is connected to a cylinder of carbon dioxide, located below the tank itself. At the first flash the actuators are touched off; these trip a device on the cylinder, causing carbon dioxide to be sprayed across the top of the tank; this blanket of carbon dioxide quickly smothers any fire by excluding oxygen; another feature of this system is that carbon dioxide does not harm equipment.

I.M.F. ORGANIC MEETING

THE Institute of Metal Finishing Organic Group will be holding its first regular meeting at Regent House, St. Phillips Way, Birmingham, on Tuesday, 9th June, at 6.30 p.m. The Chairman will be Mr. A. A. B. Harvey, and the speaker for the evening will be Mr. R. Tilney, A.M.I.Mech.E., who will give a talk on "Electrostatic Painting." The talk will be accompanied by a film showing modern developments of the process. Further details are available from the I.M.F., 32 Great Ormond Street, London, W.1.

DRUM AND CONTAINER FINISHING PROCESS

ALREADY an article has appeared in INDUSTRIAL FINISHING describing the plant at Rheem Lysaght Ltd. This article refers specifically to the finishing schedule.

It is true to say that the basic ingredients of drum manufacture today are still "steel and paint." The only major change through the years comes from the ingenuity and resource of the engineer, and his capacity to cater for the demands of his consumers.

However, when considering the relationship between the engineer and paint a very different set of circumstances arises, the engineer seldom thinking in the same terms as a chemist. It is at this stage that the paint technician enters the scene to produce the necessary protection and decoration.

A drum line has been laid down at Bristol to produce drums and American-type pails in their various sizes, all fabricated in accordance with American engineering practice design, incorporating "Trisure" closures and double-seamed chimes.

On finishing procedure, the development and research of the specialised finishing materials for the Bristol plant were developed in close collaboration with Robt. Ingham Clark and Co. of London.

Finishing materials from a production point of view are divided into two classes:

1. Spray finishing after fabrication.
2. Rheemcote process.

Spray Finishing

The fabricated drums having been leak-tested are passed through the Stordy metal pretreatment/cleaning plant as follows:

	1	2	3	*Dry*
Material ...	Bonderite 55	Running water rinse	Chromic acid	Dry off
Concentration ...	54 lb. to 100 gal. H_2O	—	4 oz. to 100 gal. H_2O	
Temperature ...	170° F.	Cold	170° F.	300° F.
	1 min.	30 sec.	1 min.	5 min.
*p*H	5*p*H	—	4·5	—

Chemicals were developed and are supervised by Metal Finishing Division of Pyrene Co. Ltd., London.

As the drum enters the washer in a horizontal position it is picked up on a conveyor and carried through the pretreatment cycle to the spray booth.

Normal production drums are then sprayed in the colour or colours by two operators, working in a down-draught booth, the drum revolving on conical rollers at about 60 revolutions per minute.

Feed to the spray booth is regulated by the pretreatment conveyor. The fact that the drum is still warm after the "dry off" acceierates the set of the synthetic enamel and cuts down "flash off" time before baking at 320° F. for 12 min.

Detailed schedules are as follows:

1. Pretreatment and cleaning: 7 min. 30 sec.
2. Spraying time: 10-15 sec.
3. Stoving at 320° F.: 12 min.

The above system gives a production on 45 gal. drums at the rate of 150 per hour.

A similar line for 10 and 5 gal. containers is in operation on parallel lines alongside, both lines feeding direct to shipping bays after inspection.

Protective container linings can also be applied on this line by spray, in the case of closed drums the bodies and ends are sprayed separately, chimes being formed after baking—open pails going through in the normal manner. Exterior decoration has to take place after the interior process is complete, as the temperature at which the interior lacquer is baked (390°-425° F.) would damage the exterior finish by over-baking.

Synthetic enamels are fed to the spray booth from a bank of 40 gal. pressure containers enabling production colours to be switched at will. Provision is made for each spray operator to use two spray guns, enabling two colours to be applied simultaneously on dual-tone drums.

Colours vary slightly in "paint mileage" when applied at standardised film thickness of 1-1·2 thou., but a general figure 30 by 45 gal. drums per gallon is achieved.

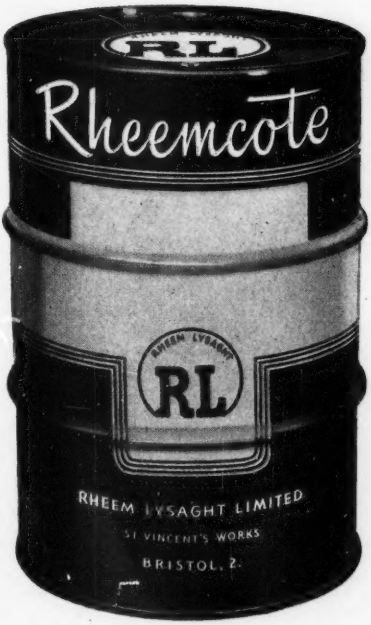
The special stoving synthetic drum enamels based on modified alkyd resins, used on this line, were designed by Robt. Ingham Clark and Co. to fit in with the above finishing system and give maximum performance.

Rheemcote is a container finishing system—featuring roller coating instead of spraying, and at the same time introducing offset lithographic decoration.

Since roller coating and printing can only be carried out on the flat sheet, the process enables the finishing schedule to be completed before the drum is fabricated.

The utilisation of roller coating offers distinct advantages to both the drum manufacturer in his production, and the container user in his packaging presentation.

Drum production figures hitherto unattainable can now be achieved by the new plant, giving a higher standard of finish at lower process cost. The fact that up to 4,000 sheets for 45 gal. drums can be finished per hour gives some indication of the immense potential. Far greater "paint mileage" at comparable film thicknesses



obtained by roiler coating as opposed to spraying, reduces paint cost per drum.

The scheme offers a wide range of finishing combinations from the normal one-coat finish equivalent to the conventional sprayed drum, to the multi-coloured lithographed pack. Protective container linings to the required resistance applied by the same method are available with any of the exterior decorative combinations.

Plant

The diagram on page 713 shows the sequence of operations through which a sheet passes during its finishing cycle.

The plant at any one time may be operating as a lithographing line, a roller coating line, or a combination of both.

On purely roller coating operations the litho-press and the applicable loader-feed are out of action and are by-passed.

Stills of sheet for drum bodies, or heads and bottoms, are fed by roller conveyor on the the Dexter feeder,[6] individual sheets are automatically fed via feed table[7] to Wagner 72 in. magnetic spot coater[8] at rates of up to 4,000 per hour. Coated sheets then feed from the coater via variable speed conveyor[9] on to the wicket-type conveyor of the Stordy convection oven[10] which is designed to cover the range of stoving times and temperatures required, the maximum operating temperature being 450° F.

The oven is arranged for Town gas firing, and is divided into six separate heating zones as described in our April issue (pp.661-666).

The oven was built by Stordy Engineering Ltd. of Wolverhampton in conjunction with Rheem Lysaght.

Sheets passing over the oven enter the cooling zone[11] where 24 in. by 18 in. fans rapidly cool the work before stacking.

When the plant is operating on litho work only the sheet is fed into Dexter loader feeder[1] which monitors the sheet via feed table[2] to the press[3] —in this way the Wagner spot coater[8] is by-passed by raising the applicator roller and allowing the sheets to pass through.

The offset 72 in. litho-press is the largest metal printing press outside the United States and was supplied by Hoe of U.S.A., and installed by Hoe and Crabtree Ltd.

The occasion when the litho-press and the coater are both in operation at the same time is solely when the final ink application is to be varnished: it is normal practice for this final print to be "wet-ink" varnished, ink and varnish being baked together.

We now come to the off-load and stacking point—for drum production it is essential that the surface which is to be the exterior of the drum should be face down—this is catered for by the normal off-loading feed, however, during intermediate stages of process when sheets coming off the conveyor have to be returned to loading-end for further printing or coating, as opposed to going direct to fabrication, it is then necessary to return sheets to the loading end with exterior surface uppermost.

The range of materials used in production finishing is as follows:

Britannia pigmented roller coatings.
Sealset printing inks.
Britannia wet ink and finishing varnishes.
Britannia protective container linings.

Pigmented Roller Coatings

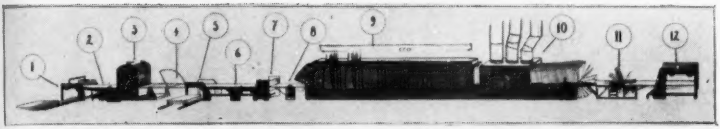
Pigmented roller coatings used either as final finish or as the base colour for subsequent lithographing, form the basis on which the process is built.

To give some idea of the physical characteristics demanded of these materials, the following are a few of the more important features:

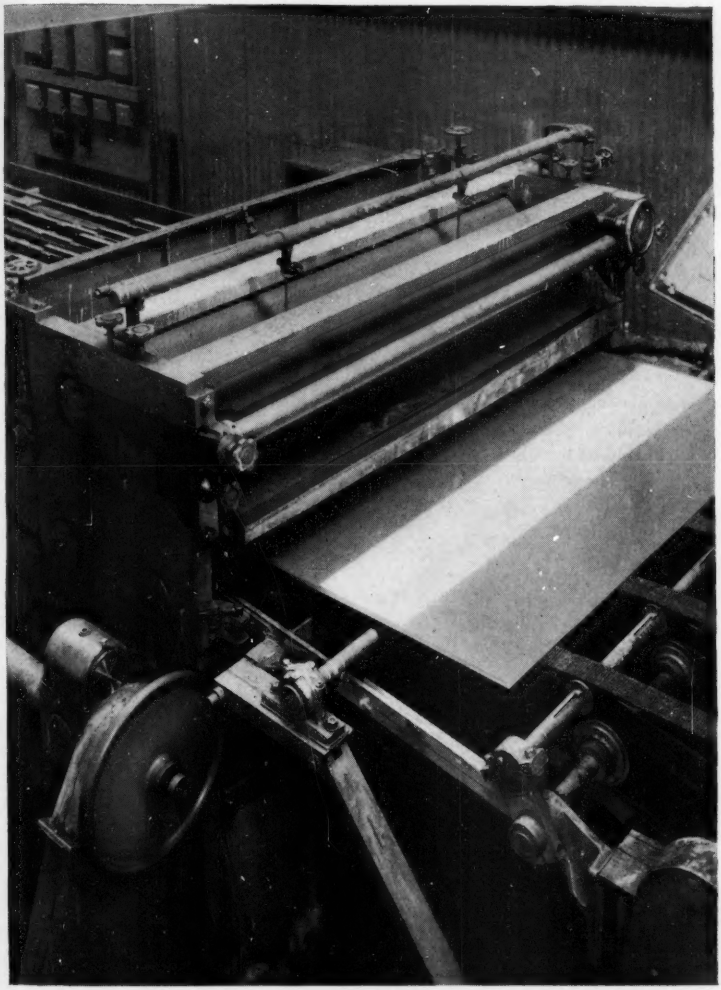
1. *Exceptional opacity.*—One coat of film thickness of 0·7-1 thou. should give complete obliteration irrespective of colour.

2. *Coating shall be marproof and flexible in tooling and fabrication.*—All baking and forming operations including insertion of "Trisure" closures make extreme demands upon the coating.

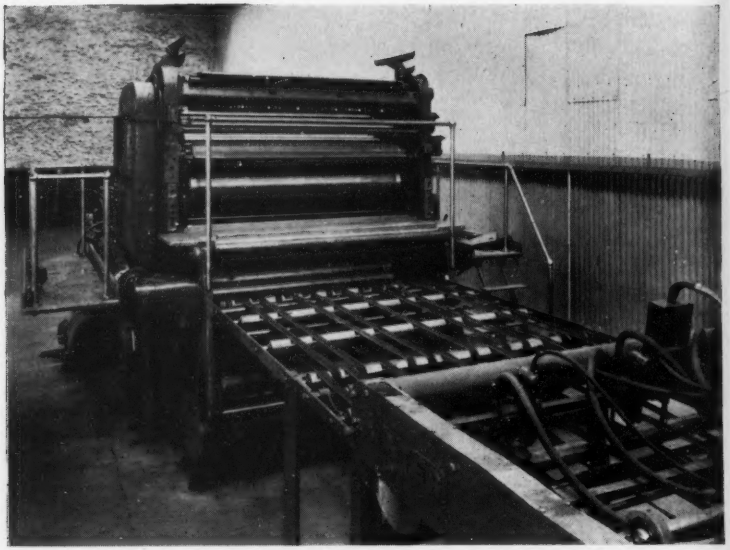
3. *Colour retention and ageing.*—Coatings must be light-fast and durable. Furthermore, during process they may receive up to eight extra bakes during lithographing and varnishing.



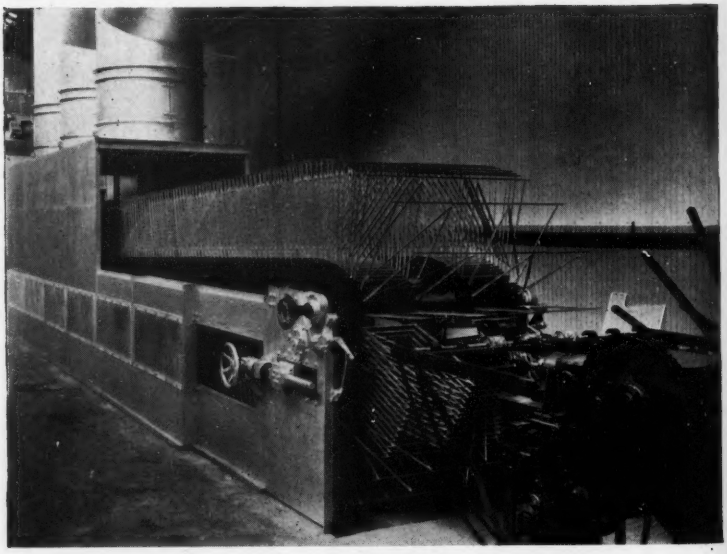
Layout of the coating plant. See text for description of units.



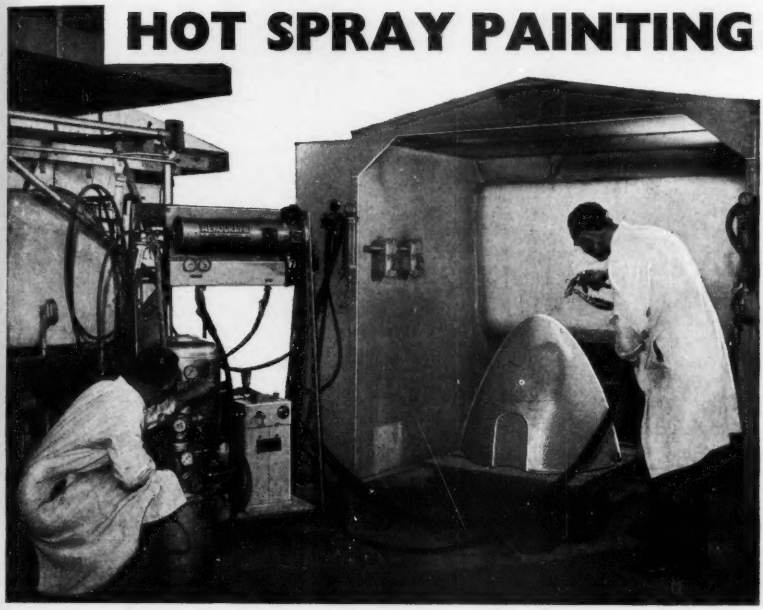
Close-up of the 72 in. Wagner magnetic spot coater. In this illustration it is running with a finishing varnish.



(Above) Dexter feeder passes sheets along to the 72 in. offset litho press. It is normal practice for final print to be "wet-ink" varnished and the two coats baked together. (Below) Cooling zone and off-take from the oven.



HOT SPRAY PAINTING



How to Control the Finish—from the Start

The great advantages of Hot Spray painting are only just being realised. For many industrial purposes the use of the pre-heating process will give an excellent finish much more quickly, with less labour and with an appreciable saving in cost.

For those who want to know more about it, the Demonstration Centre offers full facilities for practical demonstrations on customers' own products. What is more, we will gladly train paint-shop operatives at specially arranged short intensive courses—at no cost or obligation to the customer.

This is *your* opportunity to gain impartial and unbiased advice on the process that is revolutionising many industrial finishing procedures. If the process is suitable for *your* product, we will show you how best to use it. If it is *not* suitable we will save you expensive "trial and error".

The photograph shows a corner of the Demonstration Centre with operators hot-spraying synthetic enamels at the water-washed spray-booth. Three types of paint heaters are shown in the illustration. Take advantage of this "know-how" and let us help you to *control* your finish.

Just write to—

Demonstration Centre

JOHN HALL

JOHN HALL AND SONS (BRISTOL AND LONDON) LTD · HENGROVE · BRISTOL 4

4. *Stacking—coating must withstand stacking pressure without any sign of sheet sticking.*—The bottom sheet of a stillage may have a pressure of up to 4 tons exerted on it.

5. *Stability and good working properties.*—Coating may have to run on roiler coater for many hours without detriment.

6. *Printing-base properties.*—Excellent reception of printing inks and varnishes at all stages of process.

Inks

The successful inter-relationship between all coating and printing materials used on the fully lithographed pack is vital to the ultimate result and performance.

In this direction sealset synthetic inks on a modified alkyd resin base were specially formulated to give maximum performance with the printing base roller coatings and finishing varnishes.

An interchange of each other's products was established between Robt. Ingham Clark and Co. and the Fishburn Printing Ink Co. Ltd., so that all potential snags could be ironed out at research level before any materials ever reached the stage of production test. This co-operation proved to be extremeiy valuable,and before the line started up, each was fully conversant with the other's products.

Varnishes

Whenever lithographing is part of a process, then a finishing or wet-ink varnish is used, its function being to protect the lithography and give a uniform appearance.

Most of the physical properties of the varnishes line up with those of the pigmented roller coatings, with an additional feature in that they are required to give exceptional "hold-up" when applied over numerous coats of ink.

Protective Container Linings

The drum linings are used to protect the contents of the container from contact with the metal surface, thus avoiding contamination or reaction.

The range of linings avaiiable cover as far as possible the requirements of the container user.

The ever widening scope of this range has only been made possible by the development of specialised coatings, which enable more and more commodities to be safely packaged in steel, replacing the more costly and less robust packs of wood and glass.

The range of materials consists of several lacquers. For non-corrosive commodities, the linings are of the oleoresinous type, giving pleasing interior appearance and cleanliness; however, for the more exacting requirements of corrosion resistance to acid, alkali, solvents, detergents, etc., lacquers of phenolic, vinyl and Epikote type are employed; these can be pigmented or unpigmented according to requirements. Some of the typical materials used in evaiuating resistance properties are as follows:

Pyridine.
Caustic soda, 10 per cent. solution.
Teepol, high concentrate.
Acetic acid, 80 per cent.
Sulphuric acid, 50 per cent.
Chloroform.

The most modern developments have produced lacquers with exceptional corrosion resistance, coupled with adhesion and flexibility of a very high order, giving first-class field performance on containers subjected to rough handling in transit.

BRITISH STANDARDS

THE following new publications, issued by the British Standards Institution, are now available:

"Glossary of colour terms used in science and industry (B.S. 1611 : 1953, 3s. 6d.). Gives standardised terms relating to colour, but does not include actual names of colours. It consists of a general section, sections dealing with methods of describing colours, colour differences, colorimetry, colour reproduction, vision and types of colour vision.

"Paint remover, non-flammable, emulsion type, water rinsable." (1-GP-78 : Canadian Government specification.)

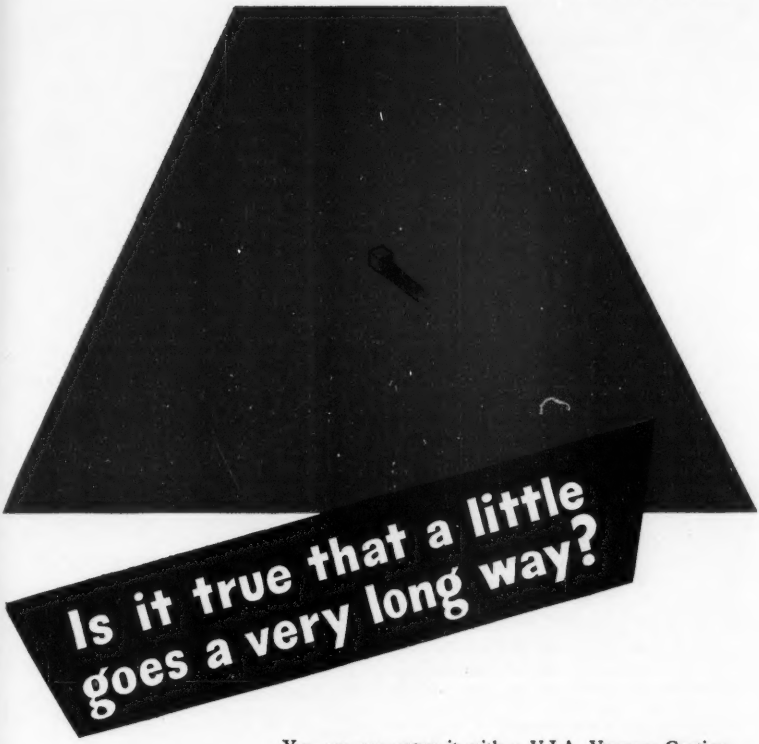
"Pigments." (810/4 : MNOSZ, Hungary.)

"Jugs, zinc-coated." (M/77316 : PN, Poland.)

"Ether for solvents and paints and varnishes." (48019 : UNE, Spain.)

"Ethyl-acetate solvent for paints and varnishes." (48020 : UNE, Spain.)

"Methyl-acetate solvent for paints and varnishes." (48021 : UNE, Spain.)



Is it true that a little goes a very long way?

Yes, we can prove it with a V.I.A. Vacuum Coating Plant. 1-lb ONLY of aluminium (or other metal if required) can cover more than 3,000,000 metal or plastic objects each one inch square. Industrial Finishers can conserve scarce or expensive metals by the use of the Vacuum Coating Process without detriment to the resultant appearance.

VISIT STAND A.31 at the BRITISH PLASTICS EXHIBITION at OLYMPIA, June 8th—18th *or write to*

VACUUM INDUSTRIAL APPLICATIONS LIMITED, Netherton Road Wishaw, Lanarkshire *(Tel. No. Wishaw 142)*

RESIN BONDED GLASS FIBRE

A NUMBER of Scottish firms are now experimenting with resin bonding and fabrication of glass fibre matting into moulded products for use in various industrial spheres. This work derives from the decision to market in mid-1953 prepared glass fibre matting suitable for fabrication, with suitable resins, into any desired moulded shape.

One market at which these experiments are aimed is the marine engineering and shipbuilding field where the resultant product has obvious scope. It combines lightness in weight with strength, and resistance to corrosion, all factors which suggest its useful application in superstructure work especially where resistance to corrosion is an important factor.

So far as can be ascertained none of this work has reached finalised form. It is accepted that this market is conservative and demands proof of efficient performance before general acceptance. It is also accepted that, price for price, the resin bonded fibre sheeting is not competitive with sheet metal. Its main scope is visualised in those applications where moulding is possible, and where a moulded product in the newer materials will replace fabricated metal component subject to the known handicaps of metal.

Samples seen are most encouraging. They include corrugated sheeting, which is virtually everlasting, sheeting in which woven glass fabric is used instead of unwoven, to give an improved appearance or finish, and moulded products which show very clearly the potential value of the materials. Present experiments are expected to reach a conclusion over the next six months.

CELLULOSE, HOT LACQUER AND INSULATING VARNISH

THREE interesting booklets have been issued by Thos. Parsons and Sons Ltd., 70 Grosvenor Street, London, W.1, covering certain of their products for cellulose finishing, insulating varnishes, and hot spray finishes. "Cellulose Finishing" describes recommended procedure for tackling the job including surface preparation by de-rusting, removal of old coatings and the subsequent applications of new coats. The various operations are given in sequence from cleaning to polishing. "Insulating varnishes" covers the range of materials made by the company for use in the electrical components industry, where good mechanical, electrical and chemical properties are required. The different preparations are described in regard to field of application, characteristics, stoving or air-drying times and temperatures and methods of coating. Covering this particular range of products, the company runs an Insulation Service Department. "Hot Spray Finishes" details Thos. Parsons and Sons' contribution to the growing popularity of this type of finishing with its certain advantages in time and material economies. They recommend their hot spray lacquers for the production line on such jobs as vehicles, furniture, metal goods, domestic equipment, etc. Various types of heater are available for use with any type of spray gun, and the publication cites data for the average heating unit. The booklets represent an extension of the training and service facilities of Thos. Parson and Sons Ltd.

NEW COMPRESSOR PLANTS

THE Aerograph Co. Ltd., Lower Sydenham, London, S.E.26, announce two additions to their well-known range of Devilbiss-Aerograph spray finishing equipment. These are portable plants, types AD and ADP, which the company claim as being ideal for painters, decorators and contractors, for maintenance work in factories and on farms; it is claimed that they are suitable also for motor-car refinishing and the many other jobs demanding a mobile finishing plant.

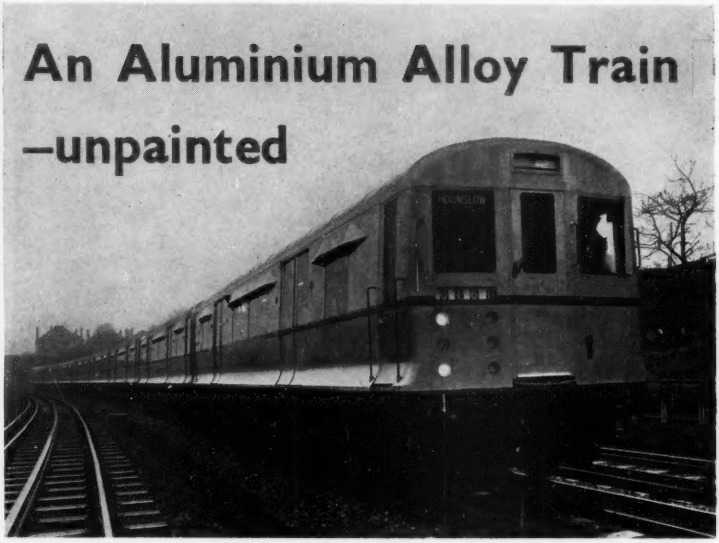
The type AD portable spray painting outfit has a twin-cylinder air compressor with a displacement of 7 c. ft. per minute; the drive is from 1 h.p. electric motor. The type ADP is powered by a $1\frac{1}{2}$ h.p. petrol engine.

Other equipment of interest is a spray booth which incorporates an air compressor, an air transformer, and an exhaust fan; these are made up into a compact unit, completely portable and requiring no floor fixings.

ELECTRONIC *p*H METER

A COMPLETE range of *p*H measurement meters and electrodes claimed to give high accuracy in many fields of application including research laboratory work and industrial *p*H control, are illustrated in a folder issued by the makers, Electronic Instruments Ltd., Red Lion Street, Richmond, Surrey.

An Aluminium Alloy Train —unpainted



SUBSTITUTES for steel arising from shortages of the metal following the war have been found to a large extent in aluminium alloys. Light alloys have been called upon to fulfil a number of duties formerly regarded as being rather beyond the scope of these materials. An example is the introduction of light-alloy construction of railway passenger cars, a relatively new development in this country. In the early part of this year London Transport announced that the first train composed entirely of light-alloy rolling stock would be going into normal service on their District Line.

London Transport originally ordered ninety surface line cars of their latest "R" type to be built with structures fabricated from aluminium alloy sheets and sections. The placing of this order four years ago represented the culmination of a long and careful investigation into the relative merits of mild steel, high tensile aluminium alloys, and rustless steel as materials for the construction of passenger car bodies for use in the intensive urban electric services covered by the Executive's activities.

Preliminary investigations included a study of experiences in other countries in light-weight car construction and in this respect the designers had the advantage of information available from Switzerland and New South Wales. Application of the principle to London Transport services and to underground stock provided fresh problems to which, however, experience elsewhere did not give complete answers; hence there was need for further research and development before a final decision could be made as to a material to be employed.

The new cars are constructed of aluminium-magnesium-silicon alloy. The selection of this particular material followed investigations into various aspects of corrosion and fatigue and it was considered, on the evidence thus made available, that the aluminium alloy would give a life at least equal to that of steel and that the stresses normally encountered in electric service conditions would be within the capacity of the material.

The majority of the aluminium-alloy cars have been put into operation in conjunction with steel driving cars from which they are indistinguishable externally, being painted in the

usual London Transport red colour except that the roofs were deliberately left unpainted for test purposes.

Because of the opportunities offered by the use of aluminium, one complete train of eight light alloy cars has been put into service in an unpainted condition apart from a 3 in. red band below the windows.

A single unpainted car had already been tried out for some months and in addition studies were earlier made on a number of test panels fixed to existing service cars. Results showed that the trial pieces suffered little from weather, dirt, or the standard washing operations. These unpainted alloy cars are otherwise entirely without protective coatings and for this reason special care was taken by the builders to remove surface defects, such as those following riveting, which would normally need no further attention before being painted in the usual way

The resistance of the aluminium-magnesium-silicon alloy to abnormal buckling stresses was examined in a series of experiments which showed that, when used in a manner comparable with mild steel, the aluminium alloy absorbs within the elastic range a greater shock than the former metal.

Washing processes for the unpainted and unprotected cars follow London Transport's standard methods. It is emphasised that exclusion of the hydrochloric acid washing process is essential but, apart from that consideration, cleaning presents no difficult problems. The cars are passed through a mechanical water washer approximately every three days, whilst at intervals of about three months they are cleaned down with a mixture consisting of equal parts of dynamo oil and white spirit with the addition of a small amount of colloidal graphite. Whilst cleaning follows the standard pattern, it is claimed that the unpainted surfaces of these alloy cars are, in fact, more easily cleaned than the painted stock.

A further important economy follows in that painted surfaces call for periodic repainting whereas the unpainted surfaces will avoid this contingency and offer special advantages in this respect.

Structurally the employment of the alloy is in line with general practice for the steel cars. This is a stressed skin design, akin to that used in aircraft, wherein the plating or skin covers a framework in such a way that the load is shared both by the plating and the framework. However, whilst the steel car stands as the prototype for its aluminium counterpart, the new metal provides certain advantages arising from the fact that it may be extruded into shapes unobtainable with the rolling technique applied to steel, allowing a flexibility in planning the construction of the framework not otherwise available when using steel. This factor has permitted the designers to employ a better disposition of materials throughout the car unit to take the stresses imposed on it.

It is estimated that the saving in weight for each car averages $5\frac{1}{4}$ tons with no loss in structural rigidity by comparison with the steel cars. The new train weighs nearly fifty tons less than its steel counterpart and this reduction in weight will be reflected immediately in reduced current consumption, a point of exceptional importance and value for services requiring a high acceleration of the train from rest. Absorption of electrical energy at acceleration represents a considerable proportion of the total energy consumed, and as there is a high frequency of short-staged stops in these urban services, economies follow automatically as a worthwhile factor.

Further slight weight economies have been obtained by the substitution of aluminium for steel in various items of equipment. To guarantee the overall advantages towards a reduction of fuel costs the control equipment has been so arranged that the operation of the contactors will produce the same curves of acceleration as for steel cars and the balancing speeds will also be the same.

Against these immediate advantages in fuel economy, long term considerations hold prospects for future savings on equipment for generating and sub-station capacity.

The overall advantages in serviceability of the new train measured against working stresses and weatherability will not be decided until a fair period of service running has been experienced to provide information and data on which to base future

policy. There are obvious and immediate gains from economies in paint, maintenance, cleaning, and fuel consumption which will justify these experimental operations until more is known about the behaviour of the alloy over a longer period.

The cars were built by the Metropolitan-Cammell Carriage and Wagon Company Ltd., who collaborated with the Metals Division of Imperial Chemical Industries in their design under the general direction of London Transport's Chief Mechanical Engineer, the late Mr. W. S. Graff-Baker.

FINISHING RESEARCH

THE British Non-Ferrous Metals Research Association, in the Annual Report, published in April, state that the results of the earlier study of the adhesion of electrodeposits on aluminium, when using the sodium-zincate replacement method, have been successfully applied to a subsequent study of a commercial process in which the initial zinc deposit is formed by electrodeposition. This latter process involves heat treatment of the plated product to ensure good adhesion, but it has now been modified to improve the initial adhesion of the zinc deposit and the inconvenient heat treatment can now be avoided. It also appears that it will be possible to use bright instead of dull nickel deposits, so that a further substantial advantage will accrue from the elimination of a polishing operation. The study continues, and it is anticipated that in the near future attention will be turned to the corresponding problem in electroplating on magnesium.

A good deal of effort, the report states, has been devoted to exposure tests on various substitute coatings which have been proposed, during the acute nickel shortage, to replace the conventional nickel-chrome finish. This has involved the preparation of a thousand plated specimens in members' works, and their exposure at several sites.

Other research includes the quality of nickel and chromium electrodeposits. The ultimate objective of these researches is to show how non-porous thin coatings of the metals may be produced, and the approach to the problem involves the development of quantitative methods for measuring the amount of porosity in the coating. During the year various methods of assessing the porosity of the coatings have been examined. Techniques advocated in the literature have been tested and found unsatisfactory, and alternatives are now being investigated.

Conservation of Zinc in Hot-dip Galvanizing

A further and more detailed study has been made of the sources of dross formation in hot-dip galvanizing. The several sources of dross were already known, but it was not clear how much each contributed to the total. The year's work has emphasised the importance of a factor which has hitherto received little attention, and attempts are being made to minimise the amount of dross formed from this particular source by changes in technique. Attention has also been given to flux covers for use in the wet process, and it has been shown, both in the laboratory and in members' works, that certain fluxes offer substantial advantages over those commonly used. Further industrial trials of these fluxes are contemplated.

Shell M.E.K. Prices Down.—Another price reduction on one of their solvents, this time methyl ethyl ketone, effective on all deliveries made after 1st April, has been made by Shell Chemicals Ltd.

The reduction in this case is by £10 per ton, so that the new price per ton at the 10-ton rate is £141, equivalent to a cost per gallon of 10s. 1½d.

Radiant Metal Finishing Co. Ltd. are shortly opening an additional factory at Hackney, where, in addition to the processes carried out at their main address at Shepherdess Walk, London, N.1, they will undertake barrel chrome plating, Rotofinish and the anodic oxidisation of aluminium. This new factory will be supervised by technicians recruited from the original personnel of the main works, but all correspondence and enquiries should be addressed to Wellchrome Works, 50/52 Shepherdess Walk, London, N.1. Telephone No. Clerkenwell 2527-8-9. The Company will continue to operate their Wenlock Road, N.1 works solely for stove enamelling as heretofore.

New Spray Gun Development

Twin Feed Paint Gun Mixes Materials in the Air During Spraying

THE American Glidden Company have been carrying out research on epon resins for some considerable time, and an interesting development recently completed has been the introduction of their "Nu-Pon A" coating material. This is an epon resin based paint which resists the attacks of chemicals, corrosion and moisture better than any exterior maintenance paint heretofore developed, and is claimed to be revolutionising the whole concept of exterior metal finishing.

One finish coat does the work of four and five coats of paint previously used for most exterior maintenance finishes required to withstand extremely adverse conditions. The resultant film is extremely thick yet flexible, hard and abrasion resistant.

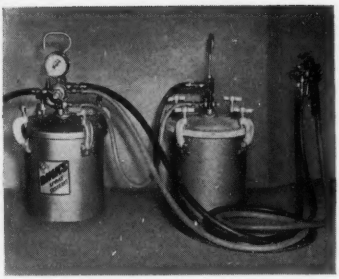
Initial use of the new finish was in the chemical industry to protect huge metal tanks from the ravages of their contents, weathering, and air-borne chemicals. Field tests indicate that it stands up much better than anything ever used before, and that it permits drastic cuts in maintenance finishing costs. So far only the surface has been scratched in an infinite number of uses for this new finish. It is ideal for marine or farm use, or where a strong, durable and resistant metal finish is needed. It has found extensive use in baked base coats or primers used in the appliance industry.

The resin base for the new finish was first developed from petroleum products by Glidden research men who recognised that it had industrial possibilities. The "Nu-Pon" line of coatings was later evolved from the resin and recently a catalyst was discovered which, when used with the modified resin finish, permitted polymerisation to take place at normal air-draying temperatures and thereby made this revolutionary finish adaptable to field maintenance.

A new type of spray gun was specially developed by Binks Manufacturing Co. for the application of "Nu-Pon A," and it is now changing the whole complexion of maintenance finishing of metal. The new gun employs the use of two fluid feeds—one for the resin and the other for the newly-developed catalyst. With the new type gun, *the two materials are mixed in the air, and the resultant paint begins to cure as it strikes the surface being finished.*

The blending of the paint and the catalyst is accomplished with a dual-feed head on the gun. Because of

1. *Picture clearly illustrates the feed system of new type spray painting gun. Catalyst flows through the hose at the right and so never enters the gun proper. The central hose carries epon resin paint while atomizing air enters the gun through the hose at the left*



2. Picture shows a typical set-up for connecting new type spray painting gun to the tanks for supplying paint and catalyst. The tank with the pressure gauge holds the epon resin paint; the other holds the catalyst. Notice the hose connecting the two material tanks. Because of this joint connection, the air pressure in each tank is identical—an important factor in maintaining a correct balance in the flow of paint and catalyst

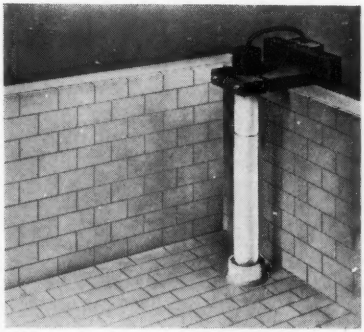
the rapidity with which the paint sets up after the catalyst is added, the two are blended after they leave the gun. Correct balance between paint and catalyst is of utmost importance, and it is on this point that the new type gun is outstanding. It is essentially a heavy-duty production gun with the precision catalyst feed system added. The exterior location of the catalyst nozzles lets the operator keep an eye on the flow of catalyst.

The hook-up for the catalyst painting system consists of the gun, an air line, and lines for paint and catalyst; two pressure tanks (one for paint and one for catalyst), and gauges and fittings. To assure a correct feed-ratio of catalyst to paint, the same air pressure is used on both the catalyst and paint tanks. All fittings in the system have standard pipe threads to speed hook-up and transfer of equipment.

This quick-setting feature allows the building up of a single finish coat to a thickness of more than 10 mil. without running or sagging, whereas ordinary finishes are applied to a thickness of approximately 1 to 2 mil. This means that the job of protecting exterior metal surfaces can now be done with one finish coat instead of four or five, and produces a film far more impervious to water and moisture-laden air. Man-hours for application are reduced sharply, the need for repeated scaffolding is no longer present, and since only one finish coat need be applied, there is no necessity to wait for 30 to 48 hr. between coats.

IMMERSION HEATER

AN electric immersion heater, the "Vitreosil," designed for use with heating, pickling, electroplating solutions and other acid bath treatments, was recently announced. An interesting feature of the unit lies in the fact that the heating element is sheathed in a pure fused silica material for which certain advantages are claimed: these include good insulation properties, high resistance to a wide temperature range and resistance to acids and plating solutions with the exception of hydrofluoric acid, and, at high temperature, phosphoric acid.



The design allows for easy fitting and may be readily adapted to existing baths. Electrical insulation is provided at the point of entry to the bath by means of a rubber cap moulded to a rubber cable —this latter fitment allows for an acute bend to the lead-in where that is necessary. An earthing wire incorporated within the sheathing provides additional electrical protection. These heating units are available in sizes of 1 to 5 kW for operation on 200-250 volts (or 1-3 kW at 110 volts). Each unit is marked to show the safe immersion depth. For this immersion heater an increased heat transfer per unit area is claimed by its makers, The Thermal Syndicate Ltd., 12/14 Old Pye Street, London, S.W.1.

Comment . . .

by ARGUS

TWO events of real significance followed one another fairly closely—firstly, was the Institute of Metal Finishing Conference at Harrogate. There has often been comment that conferences in the North were not so well attended as those in the South, but this was certainly not the case on this occasion, and there is no doubt whatsoever that this Conference was highly successful and pulled in a large number of visitors from Sheffield and the North who have to think twice before coming as far South as Torquay or Eastbourne.

The advantages of these conferences are not, of course, reserved merely to the papers and the technical discussions thereon—they afford an excellent opportunity for members to get together with members and discuss their own particular problems and, in effect, the exchanged information "on the side" in respect of this is very valuable indeed.

On the commercial side, just as the Conference finished in Harrogate so the British Industries Fair opened in Birmingham. Once again the suppliers of finishing plant and equipment were well represented. As a purely personal impression, one can say that the electroplating side showed the greatest degree of progress since last year. It is generally appreciated that the greatest savings in terms of an electroplated finish are realised by a reduction in manual handling and, of course, automatic control cutting the human error to the minimum. The British Industries Fair showed tremendous advances which had been made on this mechanisation of electroplating. In addition, of course, there has been a need for many years for adequate consideration to barrel plating. Many of the barrel plating appliances which have been sold in the post-war years were somewhat Victorian in design, but now all the well-known suppliers of plant and equipment are demonstrating new barrel plating plants. In the same way the question of automatic and semi-automatic polishing machines has been overlooked until recently, but now this deficiency has, to a large extent, been overcome. There is no doubt that the report of the Finishing Team which visited America under the auspices of the Anglo-American Productivity Council, has been read and assimilated by plant and equipment manufacturers, for the emphasis throughout the Exhibition has been upon mechanisation.

Again, the lesson preached by suppliers of finishing materials that the article must be clean before it is finished seems to be bearing fruit. Now, for example, it is difficult to find any motor-car manufacturer or supplier of motor-car accessories who is not taking advantage of a phosphating process in one form or another where, of course, there is adequate assurance that the surface to be finished is quite clean.

Again, as far as the finishing industry is concerned it is bad if equipment and plant for finishing is badly finished itself, and it was noticeable that most plant and equipment shown on the stands had a distinct improvement in this respect. In the light of the retrogressive comment on the finishing of machine tools provided by the Machine Tool Productivity Team in its visit to America under the auspices of the Anglo-American Council on Productivity, in which they were advocating a reduction in the finishing standards of machine tools, one was interested to examine the machine tools on show to see whether any noticeable reduction in

finishing standards had been considered —broadly speaking, the answer was No! It would seem that the manufacturers of machine tools did not feel like jeopardising their export sales by a tawdry finish on a high-class piece of British craftsmanship.

Throughout industry there is a growing realisation that the ultimate costs of British products for sale abroad must be reduced. Finishing can be an expensive process—yet three-quarters of the cost of finishing resides in the preparation of the surface and the application of the finish. Only about one-quarter resides in the finishing materials themselves.

Two points stand out: Firstly, one cannot reduce the quality of the finish without interfering with sales appeal and resistance to corrosion. Secondly, of course, the cost of finishing must come down.

Which simply means that in the years which lie ahead greater and greater attention will be given to the curtailment of wasted labour effort upon handling, and in this respect more and more manufacturers will turn to the use of automatic equipment to do the job previously done by hand. Which means further that as far as suppliers of plant and equipment for finishing are concerned, they should look forward to good business prospects providing that they pay attention to the design of equipment which has a real functional contribution in this respect.

Poor Quality Plating

THE chairman of the National Committee of the Metal Finishing Association, Mr. A. E. Abbott, has made a detailed reply on behalf of the Metal Finishing Association to the numerous complaints of poor quality plating which have appeared in the press and elsewhere during recent months. He says:

"I have read with interest, and some concern, the correspondence in press columns in recent weeks concerning the poor quality of electroplating, and would like to suggest to the public in general and to buyers of plating capacity in particular some of the reasons for this poor quality and the remedies available.

"In the immediate post-war period when there was a sellers' market for every type of manufactured article there was a shortage of plating and polishing capacity. This shortage attracted to the metal finishing industry a large number of "mushroom" firms who with possibly little or no experience, were able in the then existing conditions of trade to establish a business by taking over some old shopping and installing a tank or two, a nickel vat and chrome vat together with a couple of polishing lathes. They thus launched themselves into the plating industry.

"In point of fact electroplating is a highly skilled and technical industry requiring continuous laboratory control, constant scientific research and shop floor supervision which was, and is, quite beyond the knowledge or capital capacity of the "mushroom" firm who all too often considered that electroplating was just a question of dipping the work into the baths and taking it out again with the result that a tremendous amount of shoddy work was placed on the market.

"It may be asked what bearing this has on present day quality. When established plating firms were able to increase their capacity to cope with industry's requirements these "mushroom" firms found they were losing business and so immediately started to reduce their prices in an endeavour to keep their plant in full employment and maintain their turnover. They were assisted in this step by the change over from a seller's to a buyer's market when the public, both at home and abroad became increasingly price conscious, and less well informed buyers of plating capacity were all to easily persuaded to fall for lower prices without due regard to quality. Unfortunately, in a price conscious competitive market this created a yard stick by which even the better informed, more sensible buyer has to measure his purchase, whether or not their organisation's merchandise is sent out for plating or plated in their own works. In plating as in anything else the quality of an article is reflected in the price. If one is only prepared to pay a low price he

must expect and certainly gets an inferior quality.

"In reflecting on this question of 'cheap' plating one should not overlook the fact that the plater's costs have in the meantime increased enormously. Wages have kept pace with those in other industries. There has been a recent Industrial Disputes Tribunal award of twopence per hour for all adult male workers, three-half-pence per hour for all adult female workers with proportionate increases to juveniles and there has, since the war, been the granting of an additional week's holiday with pay. The cost of anodes has gone up alarmingly, and even more disturbingly has the cost of overheads such as chemicals, acids, polishing mops, electric power and transport.

"This life of a chromium-plated article is dependent mainly upon the depth of the undercoat of copper and nickel, or nickel only, as the service life of the component demands, together with good adhesion, and porosity down to a minimum, it being well known that nickel is of a porous nature when deposited. Now without being too scientific, the layman will quite easily see that if a thin coat of nickel is applied to an article the porosity is far greater than it would be in the case of a much heavier deposit, the consequent result being then that in a porous deposit, battery action rapidly sets up with the formation of a film of rust or corrosion appearing after a very short space of time. This being so it will be readily seen that by cutting prices by these 'mushroom' firms, and by the ensuing cutting down of the valuable copper and nickel undercoating the durability of the plated article to put it mildly was greatly impaired.

"There are, of course, other contributory factors such as the 'scarcity of nickel' and the schools of thought in respect of bright nickel deposits *vis-à-vis* dull nickel and buffed deposits. These technical questions along with many others are being pursued continually by the British Non-ferrous Metal Research Association, The Institute of Metal Finishing and the Metal Finishing Association acting in fairly close collaboration.

"In the meantime, however, I would warn the public against articles the price of which has been kept down at the expense of the quality of the plating—the all important protective covering, and I would most strongly recommend all buyers of plating capacity to deal only with reputable plating companies whether they require light or heavy deposits.

"Buyers may have confidence in all members of the Metal Finishing Association who are carefully screened before acceptance, and whose membership is made known by the badge of membership on their stationery which is a guarantee of their integrity, their service, their technical knowledge and skill, and an assurance that they will give the best possible finish available for the money the buyer is able to expend."

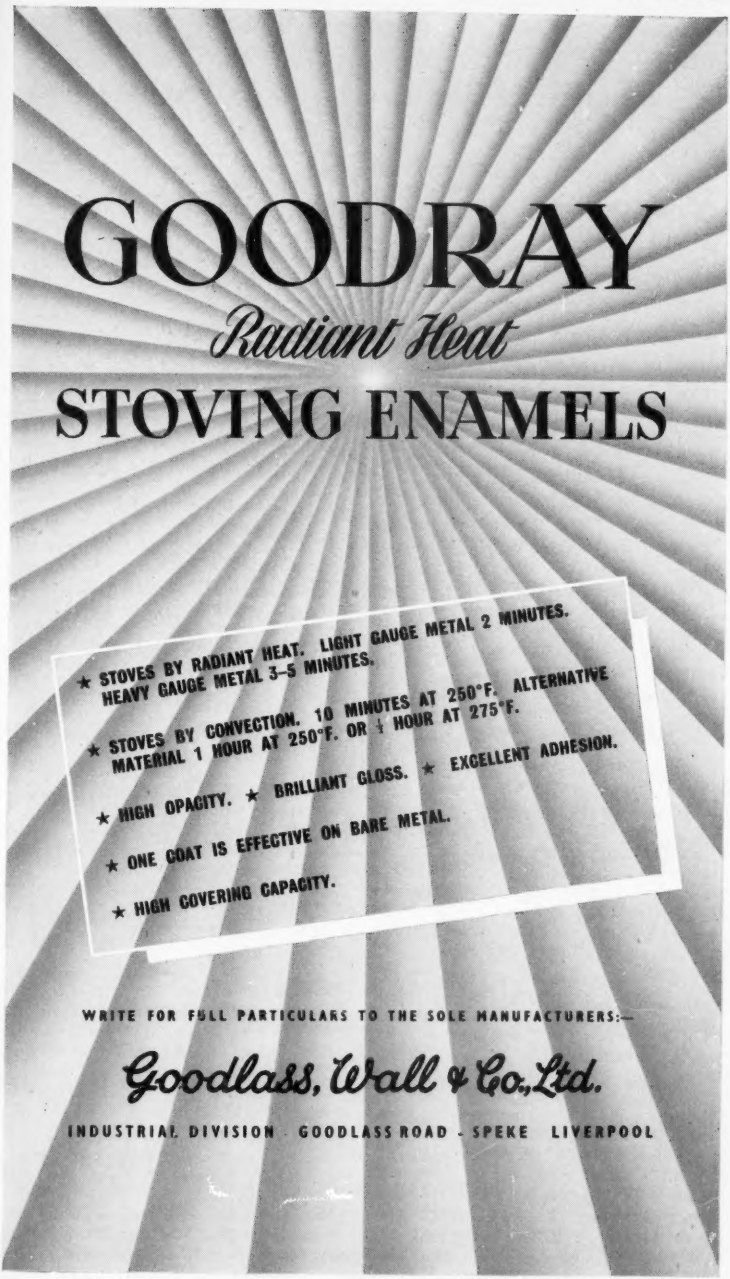
"COLOURIZER" NOW AVAILABLE IN ALL DISTRICTS

JENSON AND NICHOLSON LTD. have now made their 999 colours available in all parts of the country. When the system was originally announced at the beginning of March, it was stated that their paints in the 999 colours would be on sale only in the London and Home Counties areas. This extension of distribution will be met by an increase in production for which special arrangements have been made.

PRICE REDUCTION

SHELL CHEMICALS LTD. announce a reduction in price for their isopropyl alcohol (standard grade) effective from 20th April, 1953. The new 10-ton rate is £80 10s. per ton, equal to approximately 5s. 7¾d. per gallon at 20/20° C. For delivery of 40/45 gal. drums, the lowest price is now £80 per ton for 50 tons and over compared with the former minimum of 100 tons and over.

A brochure describing their Vibro-Electric equipment, is available from Podmores (Engineers) Ltd., Shelton, Stoke-on-Trent. In addition to its descriptive matter the publication is illustrated throughout by examples of the application of the equipment.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Mechanised Phosphating Plant

CAST-IRON components of electrical switchgear, by reason of the exposed positions in which it is installed, and the comparative neglect of attention to the surface finish after installation, are almost invariably found to be in a rusty condition. In an endeavour to obviate this George Ellison Ltd., of Birmingham have been carrying out some extensive tests on phosphating plant and methods which have culminated in the installation of a mechanised phosphating and pretreatment line.

The aim was to establish a system and a method which would enable them to ensure a good, rust-proof finish and a paint bond with the minimum of expense as the switchgear market is highly competitive. The preliminary tests were carried out in quite a small way. Initially, experimental tanks only were installed. Cast-iron parts of every description were subjected to tests with leading rust-removing/preventing and paint-bonding processes.

The potential choice of processes were narrowed by elimination until, say George Ellison Ltd., "several pretreatment processes were re-tried. It was found that phosphating by some well-known proprietary processes did not prove satisfactory on a cost/efficiency basis. The best results for Ellison's purposes were obtained by Jenolizing."

Extensive tests terminated in a decision in favour of installing a larger experimental tank of 100 gal. capacity with which more extensive tests could be run.

Castings varying from starter and circuit-breaker cases to couplings and accessory components were chosen for their extremely rusty condition. A completely comprehensive range of test pieces was treated in the 100-gal. tank by hand methods only. The trials were constant for some six months; then the findings were again studied by Ellison engineers.

As a result, a decision was made to go ahead with the installation of an automatic plant of sufficient capacity and versatility to treat the entire range of iron castings.

Jenolite engineers and technical consultants working in co-operation with George Ellison engineers, surveyed the proposed site. The engineering department produced blue prints of original design and specification calculated to provide a completely self-contained plant.

The plans were approved. The plant went into production; simultaneously, work began on a building to house it; within six months the installation was working in harmony with the production line-up.

The production sequence was, of course, an important consideration in planning the plant's capacity. George Ellison Ltd. have castings delivered direct from their own foundry. From the reception depot castings go through grinding and machine shops before the phosphating plant. Thus, the capacity of that plant is sufficient to take the flow of material being turned out and of sufficient output to feed the subsequent sections; namely, initial assembly, and the final assembly where castings are assembled with other components to form complete electric switchgear.

To meet this demand the plant installed is capable of rust-proofing 100 units per hour of 28 lb. average weight. In design, the plant has a switchback appearance; immersing castings into and lifting them out of four tanks.

The first, with a 600-gal. capacity, contains alkaline degreaser at 98° C. The second—cold water rinse, again of 600-gal. capacity—is followed by a 700-gal. capacity rust-proofing tank. This contains Jenolite R.R.N.1 at 70° C. The components, lifted out of this, are carried to the fourth and

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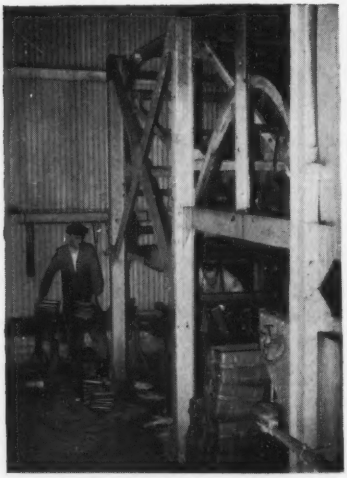
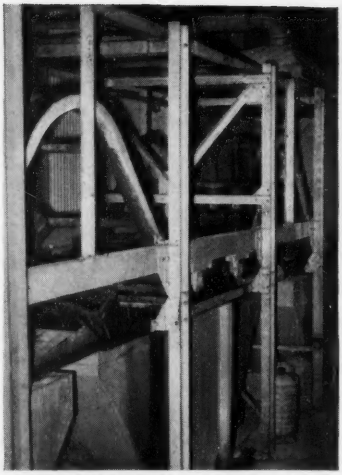
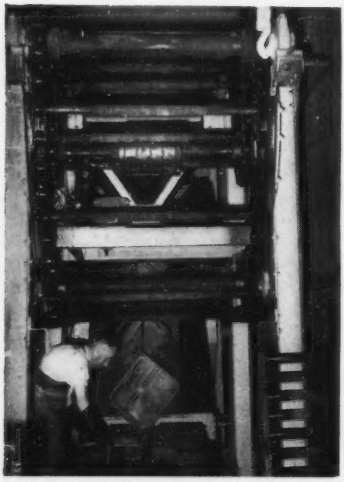


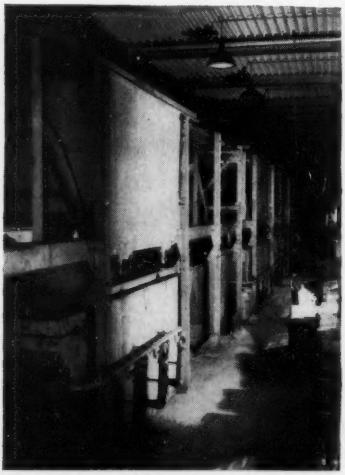
Castings are loaded on at this point



The switchback roller conveyor dips in and out of tanks



View in the interior of the tank line



General view down the line of the plant

final tank, again with a 700-gal. capacity, of a hot dilute Jenolite rinse at 98° C.

The over-all length of this plant is 86 ft. Components are attached by hooks to the conveyor bars, of which there are 100. Each bar is capable of carrying 1 cwt.; the system is rotated by 200 ft. of 6-in. pitch chain.

The conveyor system is supported throughout on a fabricated steel frame-work incorporating channel columns to floor level with specially constructed welded feet bolted to the floor. The steelwork throughout is braced and gusseted to ensure rigidity.

(*Please turn to page* 736.)

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REFRIGERATOR FINISHES

by

B. M. LETSKY, M.Sc., F.R.I.C.

REFRIGERATOR finishes provide an excellent illustration of the adaptation of chemical engineering to the solution of hygienic, protective and decorative problems, in a manner compatible with time, cost and mass production. It is gratifying to note, therefore that, in the main, these adaptations are being fully utilised by this mushroom modern industry.

Due to major advances in the pure and applied chemistry of *organic* synthetic resins, we tend to overlook the important improvements in methods and materials for *inorganic* finishes, in which Great Britain leads the world. The use of cadmium and new methods of electroplating and polishing, hot tinning and galvanising, calorising, sherardizing, cementation, aluminising, chromising and metal spraying are all successfully employed at some stage in one of the many industries which contribute to the finished product. Increased flexibility in the formulation and application of vitreous finishes and expansion of the use of stainless steel also make an important contribution, which would be even greater, if the question of cost were not so paramount.

Nevertheless, despite all this, we must admit that the most spectacular advances have been in the realm of organic finishes . . . advances which bring them within the realm of the permanence and durability of inorganic materials. It is true that the vast majority of organic finishes would be destroyed at temperatures exceeding 600° F. while many inorganic finishes would remain unimpaired. But this is irrelevant. The question is whether organic finishes can be as permanent as inorganic finishes *under the actual conditions of use*. The actual conditions for refrigerator finishes can be briefly stated as follows:

1. Protection of ferrous and non-ferrous metals against corrosion or deterioration.
2. Maintenance of intact film and pleasing appearance against the attack of fruit and fatty acids, distilled water, salt solutions, mild alkalis, etc., at temperatures from 0° F. to 130° F.
3. Resistance to shock and abrasion.
4. Adequate life.

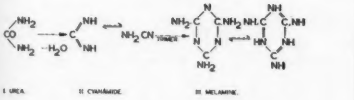
The minimum length of life of any refrigerator finish must be equal to the life of the compressor or other machine, before major overhaul is required. The ideal to be aimed for, is the full life of the refrigerator till its replacement. Until the last decade, vitreous finishes were used throughout for high quality work, as giving the most permanent and pleasing finish, at reasonable cost. Nowadays, large scale production of synthetic resins which are tough, chemically resistant, economical and durable, has made possible partial and even complete replacement of vitreous enamel at lower cost and more flexible production methods.

The complex relations between chemical constitution and increased stability and resistance to mechanical and chemical attack of the ever widening range of synthetic resins available, would make the most fascinating reading, if and when this interesting topic could be comprehensively discussed. Here, we can only indicate it very briefly, with reference to some of the more important resins concerned.

Oil modified alkyds are excellent for resistance to water and colour stability under normal conditions, but gave way to the superior abrasion and chemical resistance of alkyd modified ureas. These in turn have given way recently to melamine-alkyd-urea combinations which must comprise the greater part of high quality organic

refrigerator finishes in general use in Great Britain today.

The melamine formaldehyde etherified resins are a direct development of the work on the similar urea-formaldehyde resins. As such, they provide a good example of the relation between chemical constitution and physical properties, already indicated above. In both cases the straight formaldehyde condensation products give alcohol soluble resins with only limited application. When the reaction is carried out in the presence of butyl or higher alcohols, both melamine and urea give hydrocarbon soluble resins with excellent compatibility with alkyds, nitrocellulose, etc. Both have non-yellowing and heat resistant properties. With melamine resins, however, non-yellowing properties are retained up to 480° F. as against 300° F. for urea. The water and chemical resistance are also correspondingly superior. The structural relation between urea and melamine is illustrated below and possible tautomers of cyanamide and melamine are indicated to underline this relationship.

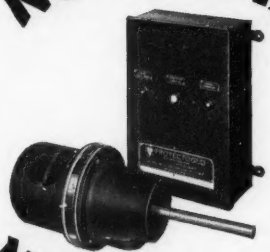


I. UREA II. CYANAMIDE III. MELAMINE

The greater stability of the melamine resins is undoubtedly due to the absence of the reactive carbonyl group, and the presence of the conjugated six member ring.

Highly satisfactory refrigerator finishes are being applied and manufactured in bulk today on melamine-alkyd formulations, but the last word has by no means been said. The latest newcomers to the field are even more interesting in their general properties. These are the group of resins classified as *Epichlorhydrin or Epoxide resins*, though in fact the finished resins contain no chlorine. Epichlorhydrin is a reactive intermediate in the manufacture of synthetic glycerine, by the high temperature chlorination of propylene. After the discovery that addition of chlorine to allyl alcohol could be completely suppressed in favour of substitution at temperatures in the

NO FLAME



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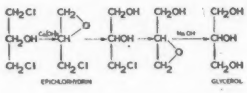
region of 500° C., the Shell Development Co. in America built a large scale plant some four years ago to exploit mainly the production of glycerine from crude petroleum, as against that from food sources, in the controlled fermentation of sugar, or the by-product of soap manufacture from vegetable oils.

The reaction proceeds from propylene through allyl chloride to dichlorohydrin. From this point the dichlorohydrin can be hydrolysed direct to glycerol by aqueous caustic soda, or, in the stages illustrated below:



The close relation between epichlorhydrin and glycerol is clearly seen, the one significant difference being in the presence of the *epoxy* group. Condensation of the epichlorhydrin with diphenylol propane in the presence of dilute caustic soda eliminates the chlorine as sodium chloride, and gives the "Epoxide" resins (British) or "Epon" resins (as named in U.S.A.). These are essentially long chain polyhydric alcohols. These alcohols, (like glycerol or pentærythritol) can be esterified with linseed oil fatty acids or dehydrated castor oil fatty acids, etc. Unlike glycerol or pentærythritol, however, no phthalic or maleic anhydride is necessary, to obtain necessary hardness and quick setting for air drying finishes. Conversion of the polyhydric alcohols to first class stoving finishes is obtained by simple blending in the cold of the esters or unmodified resins with urea or melamine etherified resins. Cold cure of the stoving resins can be effected by pre-addition of ethylene diamine or tri ethylene diamine.

These resins, both air drying and stoving, set a new high level for resistance to heat, yellowing, chemical attack and mechanical abrasion. They have been produced in bulk for the last three years at the Shell Corporation plant at Houston, Texas. Increasing quantities for the British market known as Epikote resins, are now being made available by Shell Chemicals Ltd.

As far as the writer is aware, only experimental quantities have been used in the refrigeration and washing machine industries in this country to date. The characteristic *epoxy* group which is still intact after the condensation with diphenylol propane makes possible the conversion of the resins by means of amines at room temperatures, and the carbon to carbon and ether links undoubtedly account for their chemical stability.[1]

When adequate supplies are available and the price is reduced, the Epikote resins are worthy of fullest investigation by the manufacturers both of refrigeration plant and industrial finishes.

1. R. N. Wheeler. Oil & Colour Chemical Assn. No. 381 March, 1952.

INTERNATIONAL CONFERENCE ON ELECTRODEPOSITION AND METAL FINISHING

THE above Conference, sponsored by the International Council for Electrodeposition, of which body the Institute of Metal Finishing (Great Britain) and the American Electroplaters Society (U.S.A.) are prominent members, will take place in or near, London in April, 1954. Plans are being made during the next few months by appropriate committees appointed by the International Council.

The Technical Sub-committee of the Conference Committee now invites authors to submit manuscripts which will be considered by the Publications Committee of the Institute of Metal Finishing for presentation at the Conference.

Papers should preferably deal with work of an original nature in the field of electrodeposition and metal finishing generally. Manuscripts should be forwarded to the Honorary Secretary of the Institute of Metal Finishing, Dr. S. Wernick, at 32 Great Ormond Street, London, W.C.1.

Vitreous Enamellers' Association.—The Association announce that in future their address will be 96 Hagley Road, Edgbaston, Birmingham 16. Tel. No. Edgbaston 4148/9 and 4140.

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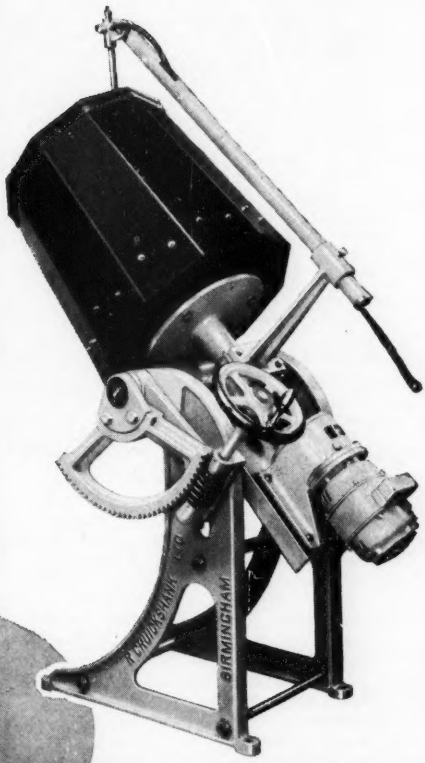

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SENIOR PLATER

This new model Senior Plater is offered to industrial platers with every confidence. There are no belts to wear, slip or break; no belt guards and no awkward raising and lowering operations.

The machine is of streamlined design with easily operated worm and wheel mechanism, and it is therefore less likely to cause accidents or loss of solution.

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SM/C. 500c

(*Continued from page* 730.)

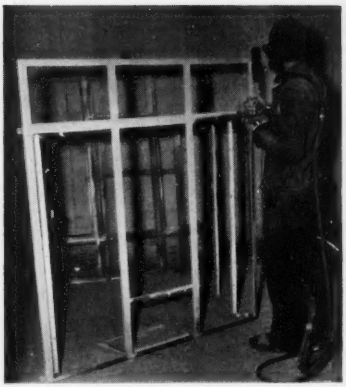
The complete unit is driven by a protected-type squirrel cage motor. From the motor a V-rope drive runs to the input shaft of a worm reduction gear; the output shaft of this gear drives the main conveyor sprockets.

Pretreated parts, rust-proofed and keyed for subsequent paint finishing, are lifted off the end of the conveyor by the operators, and passed to the paint section.

Here components are dipped or sprayed in primer paint. The dipped castings are hung on a conveyor system which carries them through a radiant heat drying tunnel operating at a temperature of 700° F. The installation of this plant has done much towards producing a finish with increased sales appeal.

Today, the plant is operating smoothly in a production line-up which is producing electric switchgear including starter regulator panels; oil rotor starters; circuit breakers; power sub-station distribution boards; mining lighting units and flame-proof distribution gear; for the home market and for export to George Ellison markets in Canada, India, South Africa, Australia, Turkey, Brazil and other world markets.

To summarise, the plant has, in effect, been designed to fit smoothly into the production sequence of the Ellison factory. The rust-proofing and keying of cast-iron components, which began as an experiment, has developed into a major consideration in the production of electric switchgear. The economy lies in the mechanised treatment of rough-castings; the profit lies in enhanced sales appeal, and in increased prestige and consequential greater sales at home and overseas.



Operator spraying metal coating on window frames.

Door and window frames being treated in the shot blasting chamber.

WINDOWS FOR THE WORLD

MANY of the major buildings in New York are equipped with rust-proofed metal sprayed windows made by a British firm. The buildings include the Empire State Building, the Rockefeller Centre, the Waldorf Astoria Hotel and Sutton Place.

Mr. D. A. Williams, O.B.E., managing director of the firm making these windows, announced this when the North-Western Regional Council of the Federation of British Industries held their bi-monthly meeting at his Chester factory, last month. Members of the Council of the F.B.I. held their meeting in the Company's board room and later toured the factory to see windows being made and finished.

The public relations arrangements for this meeting were handled by A. E. L. Mash and Associates.

. . . . . the Sales Managers goal at all times, therefore put your products in the lead with Glasso—the finish that protects, beautifies and SELLS ! There's a Glasso finish for every surface . . . . wood, metal, stone . . . . a finish that is easy to apply and economical in use. Let us know your problem we shall be happy to advise.

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FACTORY SAFETY

COMMENTS ON FINISHING DEPARTMENTS

THE "Annual Report of the Chief Inspector of Factories for the Year 1951" appeared in March, 1953, priced 6s. 6d. net (H.M. Stationery Office). It contains much of interest to the Finishing Industry.

The Chief Inspector has taken an opportunity to perform a valuable service by reviewing the changes which have taken place in the industrial field over half-a-century of time. Some older personnel may find material for nostalgic ruminations, particularly when considering the greater skill demanded in various trades and the more friendly atmosphere of the smaller workshop. The younger man or woman will marvel at the patience required to endure conditions of employment which now seem to be arduous, but were common at the beginning of the century.

Behind the changes which have come about in factory design and layout, in working conditions and welfare, is the story of the growth of mechanisation—of motive power replacing muscular performance; of the machine taking the tool from the hands of the operative and its later combinations into a sequence of high-speed operations; of the conveyor belt replacing the trundling truck in the movement of work about the factory floor; of the large undertaking swallowing up or outpacing the family business; of the remote board of directors instead of the familiar "Boss" or "guv'nor"; and a host of other modifications, regretted by some, welcomed by others, each with its advantages and disadvantages.

These changes, mechanical, technical and psychological, have reproduced their own equivalents in social reorganisation. In reading this report the old "hand" will measure the new ways against the old times; the new entrant to industry, who would turn away from the once familiar sign, "hands wanted," will reason in reverse order. The result will not be a majority for what has gone before for the new gains are substantial to both employees and managements and represent a new standard of reckoning.

Old hazards to health and safety have passed with the disappearance of earlier methods of production. New problems have arisen by the introduction of new materials and processes. The outstanding difference today lies in the fact that where danger arises, those concerned are quicker off the mark in taking measures to counter those dangers.

The welfare officer, previously a restricted junior amongst his colleagues, has assumed an importance, particularly in the larger establishments, commensurate with his growing responsibilities.

The production engineer is now learning from his welfare associate new and vital facts about the human element in output; a question previously presumed to be dependent solely upon technical considerations.

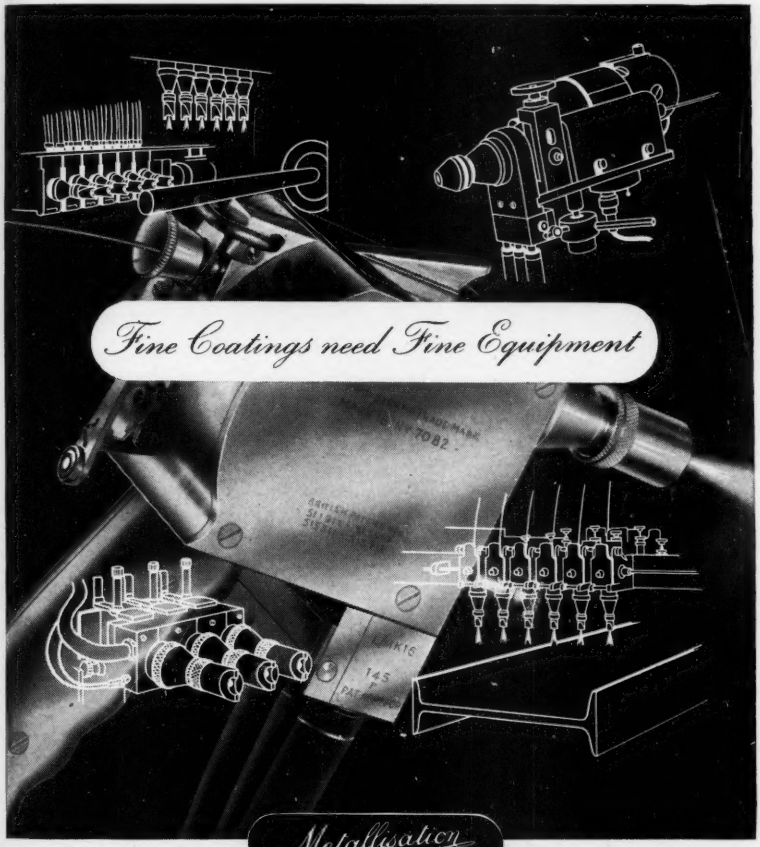
That there is no finality in the battle to safeguard health and person in the constantly changing pattern of industry, and to quote the Report:

". . . . new hazards have arisen in file making, thus cyanide compounds for hardening, lead baths for tempering and sand and water used for scouring still present hazards which require full attention."

"Chromium plating, which caused serious cases of ulceration on its introduction in the twenties, has been made largely safe by the observance of the Regulations made in 1931, which required mechanical exhaust, medical examination, washing facilities and protective clothing."

Figures coming under the heading of lead poisoning are interesting for the comparison drawn between the incidences of such cases in 1900 and

METAL SPRAYING BY THE WIRE PROCESS GIVES THE GREATEST PROTECTION AGAINST CORROSION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CONTRACTING: METALLISATION LTD., PEAR TREE LANE, DUDLEY, WORCS.

the year 1951. The reductions are significant. In paint and colour works fifty-six cases were reported in 1900, while in 1951 the figure had dropped to seven.

For ulceration resulting from chromium plating the story is different: fifty-seven cases were reported in 1930, and the number shows a steady rise to 111 cases in 1951. Chrome ulceration, like lead poisoning, is a notifiable disease.

Metal Spraying

Referring to the increasing use of metal sprays, the Report instances the use of aluminium for spraying articles and says ". . . the spray which misses the article under treatment is carried by means of ducting to cyclones, where it settles as dust. This dust is capable of causing dust explosions, and such an explosion in a cyclone could be extremely violent and dangerous. The manufacturers of the spraying plant have been in touch with the D Department and arrangements have been made to ensure that the cyclones are installed in the open outside the occupied workroom."

A further example of the dangers of certain dusts as explosive potentials is extended to plastics. An explosion occurred during a process of grinding a synthetic resin in a plastics factory.

Cellulose Solutions

The dictum, that one "cannot be too careful" is well illustrated by an accident which occurred in a cellulose spraying shop. In this case all materials had been returned to store with the exception of about half-a-pint of cellulose lacquer and half-a-gallon of thinners; an operative was using some of the thinners soaked in to cotton wool to clean her hands when a man beside her lighted a cigarette; the flame passed from the lighter to the cotton wool and thence to other parts of the shop.

The following example of carelessness and seeming ignorance is all the more remarkable because the incident had its origin in the action of a manufacturer's representative who was visiting a customer's factory. He was standing in a room where cellulose was used and declared that "it would not be dangerous to light a match." He struck a match and applied the flame to the cellulose blob which had concentrated at the end of an article shortly after it had been dipped: the blob of cellulose caught fire and set light to some cellulose solution in a tank underneath which flared up immediately. The end-piece of this story is that the unintentional fire-raiser while trying to drag the tank out of the room tipped the tank up and the flaming contents spread over the floor of the shop.

Further attention is directed to some dangers associated with cellulose spraying and the Factory Inspector considers that in many factories the seriousness of fire risks are not always appreciated and says that they "appear to be under the impression that so long as an effective exhaust system is provided to deal with the atomized solvents all danger is removed. This is far from being the case, as most cellulose fires seem to start at the accumulated deposits on fans, booths, tables and equipment. This is particularly true of the "hot lacquer" plants in which cellulose solutions are circulated by a pump through a heater before spraying. The pumps and heaters are often electrically operated and the combination can lead to serious fires, such as the following one:

"Along one wall of a furniture factory there were three two-operator wet back booths, at one of which "hot lacquer" spraying was being carried out with an equipment of old and unsatisfactory design which was connected to the system by means of a flexible cable and wall plug and socket. At about 10 o'clock one morning the works manager, on entering the room, saw the fire in its early stages and noticed that it was concentrated at the flexible cable feeding the unit. In all probability the cable had become abraded owing to wear and tear and contact with the vibrating machine until a fault developed resulting in arcing and ignition of cellulose deposits. . . ."

Modern Hot Lacquer Plant is Safe

Apparently the damage was considerable and resulted in loss of production for some weeks, but it is interesting and reassuring to find that

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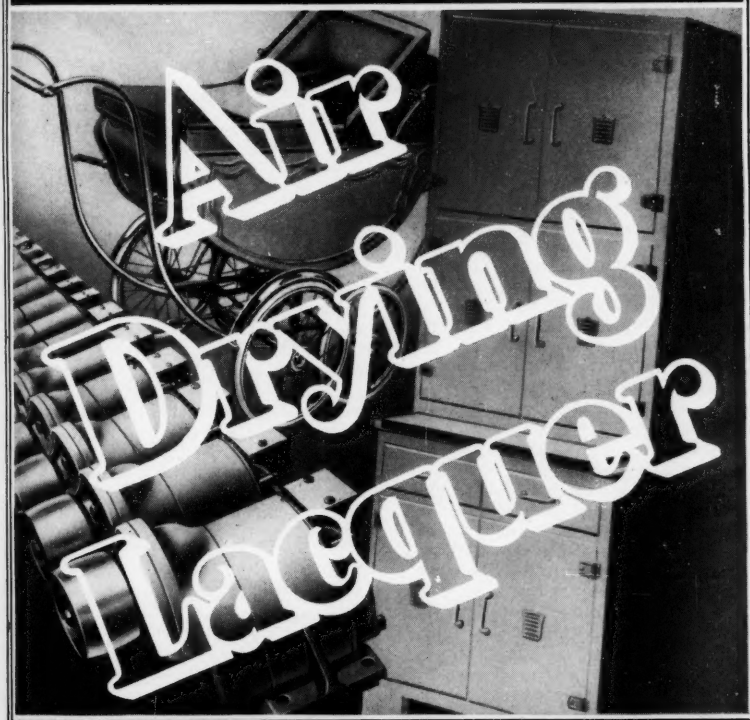

Full description in Technical Pamphlet No. 10

ON REQUEST TO :-

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the Inspector reports further to this incident that the manufacturers of hot lacquer units have modified the designs, and purchasers of the original equipment can now obtain individual components to bring the equipment up to the improved standard. It is recommended that wherever possible the equipment should be wired up in conduit and not connected to the system by flexible cable.

Static Electricity

Some interesting notes occur relative to charges which are electrostatic. In the drying off of low flash point solvents a static electricity can be generated which is capable of emitting sparks and, under certain favourable conditions, may cause ignition. The Report gives certain incidents in this category, the first concerning some persons working in new offices with highly polished asphalt floors. Complaints were made about electric shocks when metal screens and furniture were touched. Investigations revealed that a common brand of floor wax was used in conjunction with a polishing machine; it was found that this operation produced a static charge of approximately 5,000 volts. By substituting a non-caustic alkali cleaning powder, a static charge of less than 50 volts resulted.

In the second case a fire was caused in a mill driven by multi-cotton ropes, the main drive of which was located alongside a steam vessel under pressure in a temperature of 600/700° F. Evidence showed that a leak in a steam pipe had generated a static charge which had ignited cotton waste from the ropes which had been fanned to fire by the rotating wheels.

The high accident rate coming under the heading of "handling goods" has shown a decrease in recent years: recorded accidents in this category numbered 53,378 in 1950 and 50,466 in 1951. For this drop the introduction of mechanical methods of conveyorising within factories must claim a large share.

Prime movers, however, show a relatively high increase from 280 in 1950 to 328 in 1951.

Sepsis cases are shown to have dropped from 1939 to a figure 37 per cent. lower in 1951.

Adequate Instruction Imperative

A point of special concern to the Factory Inspector is the number of accidents involving young persons. In this category there has been a welcome reduction, but stress is laid on the advantages of adequate instruction in the handling of machines and materials to young persons. One example may serve to illustrate his plea: A boy of seventeen took a five-gallon drum which contained about half-a-pint of cellulose solution into an open space; he dropped a lighted match into the drum, but fortunately an older worker who was nearby extinguished the flames, but not before the boy's face had been severely burned.

Coping with the impetuosity and lack of knowledge to be found in youth is not impossible. One electrical engineering firm, which employs 1,300 people, had an accident frequency rate of only 0·53, and in three years had only one slight accident to a young person.

A most interesting reference is made in the report to the setting up of a safety committee, following a serious accident, composed of the maintenance engineer, the assistant manager and shop stewards. Visits were made to other works, and the assistance of the Royal Society for the Prevention of Accidents was sought; danger points were indicated and precautions recommended. The safety committee subsequently has carried out frequent inspections of the works with interesting and advantageous results.

Accidents and First Aid

Some callous expedients undertaken in cases of accident are recorded from the memories of older workers. One of these refers to the practice in the furniture trade of treating a flesh wound with materials immediately available from the trade. In such cases the dressing consisted of wood shavings, or shellac finished off with wood shavings. In the bicycle trade in Birmingham, girls were frequently affected by the rubber solution used; when this occurred they were taken outside the building and deposited on the ground to recover in God's good time. This last example, however, seems to cap the lot. A man having

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—when applied to the latest products of British Industries, implies new conceptions, new materials and often new technology.

Our latest development in Metal Finishing Technology is the BONDERIZING 'SS' Process which is assisting the cold forming of Stainless Steels, and similar materials.

In twenty-five years we have accumulated a great deal of experience, and its associated "Know-How", in the industrial application of Phosphate and allied Coatings. Our Metal Finishing Processes in the BONDERIZING, PARKERIZING, PARCO-LUBRIZING and PYLUMIN ranges now number twenty-two, and are in daily operation in over 1500 plants throughout the British Isles.

One of them is almost certain to be the answer to that problem that's bothering you. Why not consult us?

BONDERIZING — Bonds Paint to Metal Surfaces.

BONDERIZING — Assists the Cold Working of Steel.

PARKERIZING — Rustproofing Process.

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had his arm taken off in the spiked rollers in a mill, was taken to hospital wrapped in a sack.

Colour in Factories

Commenting on the general appearance of factories in the early part of this century, the Report says that "colour was not thought suitable for factory buildings, and the only diversity was between white walls and black, grey or brown paint." As an illustration of this gloomy approach and its gradual evolution to an enlightened realisation of the value of light and colour, mention is made of a mill in Dundee, the internal woodwork and pillars of which were tarred.

In 1915 the walls and woodwork were painted a brown colour and this gave way to in 1929 to a colour scheme when the roof was painted white, the dado green, the upper part of the walls a corn yellow.

The changes towards the varied use of colours were not solely at the instance of managements for, particularly since World War II, suppliers of paint have themselves gone far to encourage attractive and intelligent schemes, whilst new colour and shade ranges combined with the output of an extensive variety of new materials, have provided the wherewithal for a bold execution in design and layout.

Spraying equipment has reduced what was a major operation in time to manageable proportions and extreme convenience.

Electrical Conduit

An interesting experiment in conduiting for wiring for electrical power is given in connection with concrete building construction. If the experiment is successful it should for such wiring to be undertaken without the use of metal conduit. It consists of a reinforced rubber tube inflated to a slightly larger dimension; this is set in the concrete during the pouring operation, and after the material has set the tube is deflated and removed. A draw-wire attached to the tube pulls the electric cable into the ducting. Advantages for this new wiring idea are claimed in minimum condensation around the cable and a reduction of installation costs.

TESTING METAL HARDNESS

THE "Indentometer" is a portable hardness testing instrument. The mechanism employs a hydraulic pressure assembly coupled to a finely-calibrated dial pressure gauge. The depth of the impression is measured by a lever to give a direct hardness reading. The dial of the gauge is graduated in units of ·002 mm. or one point of the Rockwell hardness scale.

Readings are obtainable on the Rockwell "C," "B," "F," "G," "E," "K," and "A" scales. A 120° cone diamond indentor is used but alternatively a $\frac{1}{16}$ in. or $\frac{1}{8}$ in. steel ball may be employed. Loads up to 150 kg. can be applied on materials up to 6 in. thick or 5 in. dia. Another version of the instrument gives readings of ·001 mm. Manufacture is by the Cabul Tool Co. Ltd., 46/8 Battersea Bridge Road, London, S.W.11; C. Tennant, Sons & Co. Ltd., 4 Copthall Avenue, London, E.C.2, are the sole distributors.

Jenolite (Scotland) Ltd. opened new and larger premises at 304/312 High Street, Glasgow, on 24th April, when Mr. W. C. Kirkwood, general manager, Scottish Industrial Estates Ltd., performed the opening ceremony. He conveyed good wishes from the chairman of the company, Lord Bilsland, to the firm and congratulated them on their enterprise. An important feature in the new premises is a laboratory which will be used to handle corrosion tests and similar duties involved in their work of pretreatment of metal and prevention of corrosion.

Jenolite (Scotland) Ltd. has been located in the High Street area for some years now and will continue their service from this new centre in much the same area.

Mr. J. Johnson Mann, director of the company, indicated that sixty-eight firms in the Scottish Industrial Estates, including leading American and Canadian firms, were now using the firm's products and services, and that increasing scope was being found in Scotland for their facilities.

The Society of Chemical Industry, Corrosion Group, met on 13th May, 1953, at the Chemical Society's Rooms, Burlington House, London, W.1, when an address entitled "Corrosion—a Field for Action," was received from the chairman, Dr. W. H. J. Vernon, O.B.E.

"FLOWSTRUT"

A NEW venture in standardised universal construction units is marketed under the name "Flowstrut." These follow the "Meccano" principle and have a slotting perforation for easy adaptation and assembly. A wide variety of useful pieces of equipment may be assembled from the units, including benches, store bays, small buildings, etc.

In addition to the slotted sections, panels are available for cupboard-type construction, whilst suitable hinges can be supplied for doors. The sections are of angle steel, rustproofed and stove enamelled in battleship grey. To each foot length of angle there are forty slotted holes, and cutting marks are provided at $\frac{3}{4}$-in. intervals.

The following further accessories are supplied with the units: standard bolts and nuts for fixing; castors and wheels for mobility; a tool kit which is composed of a double-ended ring spanner and cutting shears. The "Flowstrut" is a product of Fisher and Ludlow Ltd., Material Building Division, Bordesley Works, Birmingham 12.

ANTI-SLIP FLOOR COVERING

THE Minnesota Mining and Manufacturing Co. Ltd., Arden Road, Adderley Park, Birmingham 8, are the makers of "Safety-Walk" type "A" anti-slip floor covering. Under the same trade-mark the company has added their type "B" surfacing. This latter is self-adhesive and may be employed where the floor surface is clean, dry and level.

Self-adhesion is obtained without the use of water or any special preparation. The material is produced in four standard sizes: 6 in. × 24 in. for normal surfaces; $5\frac{1}{2}$ in. × $5\frac{1}{2}$ in. for tiled flooring; 4 in. × $8\frac{1}{4}$ in. for overlaying brick floors; and stairway strips of $\frac{3}{4}$ in. × 24 in.

The strip method of application allows for easy fitting to walkways, floors, corridors, and so on, and easy replacement when that is necessary to worn parts. The material, which is rolled or hammered to the surface being covered, has a backing sheet to protect the adhesive side. This backing sheet is removed immediately before application.

It is claimed that the material is unaffected by temperature extremes, is durable, and suitable for industrial establishments as well as domestic usages. Made of extremely hard mineral grains coated to a heavy, tough, treated fabric, "Safety-Walk" may be used where normal wheeled internal transporters are used.

NAMES IN THE NEWS

Appointments

Chairman for 1953 of the Paint Federation of India is **Mr. A. V. Niblett** of British Paints (India) Ltd., with **Mr. John Nicholson** of Jenson and Nicholson (India) Ltd., as the Federation's vice-chairman.

On 1st April, 1953, **Mr. Donald MacPhail** took over the responsibilities of sales director with the Indiestructible Paint Co. Ltd. Mr. McPhail was manager covering Scotland and Northern Ireland and was deputy sales director from September, 1952. He represented this country in the Davis Cup Singles in 1946, and is a well-known figure in sporting circles.

Dr. J. O. Cutter, formerly with the Paint Research Station at Teddington for some years, is now chief chemist for Scott Bader and Co. Ltd., synthetic resin manufacturers.

Imperial Chemical Industries Ltd., have notified the following divisional appointments:

Mr. L. B. Ryder is now chairman of the Lime Division; **Dr. S. W. Saunders** assumes managing directorship of the Billingham Division jointly with **Mr. W. B. Scott**, and **Dr. D. M. Bell** has been appointed to the Billingham Division Board; **Mr. S. Henderson, Mr. G. W. Innes** and **Mr. G. A. Richmond** are now members of the Alkali Division Board; **Mr. F. Steadman** has been appointed to the Plastics Division Board; **Mr. S. B. Cormack** and **Mr. C. G. Harris** have received appointments to the Board of the General Chemicals Division.

Mr. W. E. Pattman is now purchasing manager of Bakelite Ltd., and **Mr. J. M. Lassen** sales manager. Mr. Pattman was with the original Damard Lacquer Co. in 1921, and on its evolution into the present organisation he became assistant to the works manager: he later undertook the development of the company's sales department. Mr. Lassen joined the company in 1940, served with the Royal Navy and rejoined the company on his return in 1946.

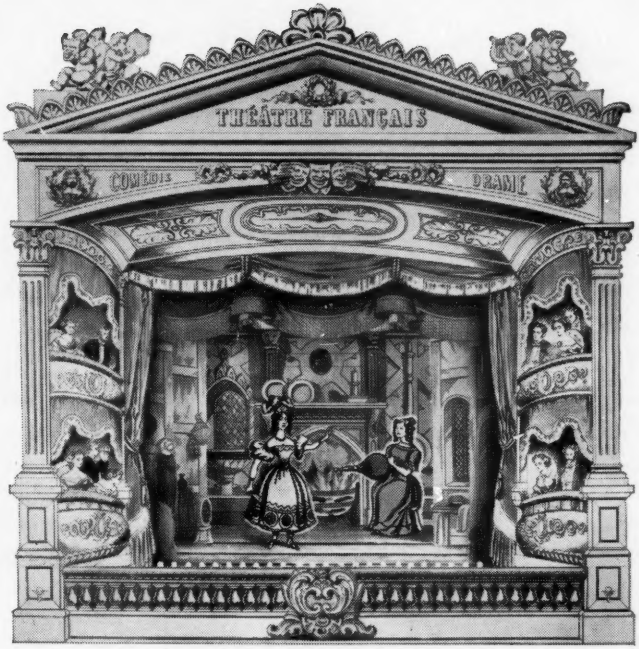
Mr. E. A. O'Neil, Junr., chairman of Monsanto Chemicals Ltd., recently was elected a director of the sister company, Monsanta (Canada) Ltd., and was appointed President of the Canadian company, for which he will assume general responsibility.

Below: Mr. J. F. Rigby of Pilkington Bros. Ltd., Mr. B. A. Williams, O.B.E., chairman of Williams & Williams Ltd., Mr. L. R. Cleworth of British Insulated Callender Cables Ltd., and Mr. T. E. Payne, Liverpool, district secretary of the F.B.I., photographed at the Hooton factory of Williams & Williams Ltd. when they acted as hosts to the North-Western Region of the Federation of British Industries.

EPIKOTE RESINS

SHELL CHEMICALS LTD. have issued an attractive booklet describing the many and varied applications of their Epikote resins. Amongst the uses to which the different grades of these resins may be put are as primers and finishes for domestic appliances, coatings for the protection of chemical plant, industrial equipment, aircraft, furniture, and so on, whilst in the field of plastics they find service as laminates, stabilisers, and "potting" compounds. Production of the resins is from a new plant recently brought into operation in Holland. The publication includes suitable charts defining the resins, their main applications, and in the case of the coatings their special characteristics according to the type of application. It is obtainable from Shell Chemicals Ltd., Norman House, Strand, London, W.C.2.

A portable electric compressor spray painting unit, the "Ronco," recently made its appearance and is available from the International Engineering Concessionaires Ltd., 192 Sloane Street, London, S.W.1.



ONE PENNY PLAIN AND TWOPENCE COLOURED

It isn't very difficult to understand why almost every customer will sport the other penny to avoid the plain things in life—yet how often manufacturers, to their cost, forget this simple truth.

Good materials, good design, and good workmanship all help to make a product efficient and durable, but it is more often the quality of the finish that first attracts and tempts the consumer. A Cellon finish will make *your* product stand out distinctively from among its competitors; make it *noticed*, and not merely *seen*—and that's the sales battle more than half won!

Cellon Limited manufacture paints and finishes of unvarying high quality (plain and coloured) for every industrial and decorative purpose. For Wood Finishing—the superb Cerric range; for Transport, Building and Marine—the renowned Cerrux range. AND FOR INDUSTRY—specially formulated finishes by Cellon with carefully balanced drying schedules to meet the specialised requirements of mass production.

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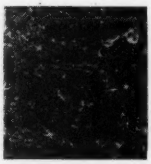
RUST PREVENTION IS SO SIMPLE

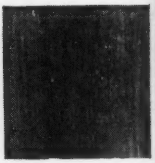
The wastage of effort and money resulting from oxidation of finished and semi-finished metal parts is very simply avoided. The RODOL series of Rust Preventives covers practically every aspect of temporary rust prevention and includes grades for application by brush, spray or dipping. In this way the Production Engineer is furnished with suitable media for any anti-rust situation. Additionally there are the allied Fletcher Miller products—SEVERINE, a non-toxic liquid rust remover, and FLICK, the universally applied easing oil. Ask for descriptive literature.

SEE HOW RODOL PROVIDES REAL PROTECTION AGAINST RUST

These enlarged photographs of mild steel plates after exposure to the standard Humidity Conditions Test demonstrate the relative degrees of protection afforded by oil media in comparison with RODOL.



Heavy Petroleum Jelly—condition after 7 days, rust attack following original smear tracks.



RODOL W.S.—completely rust-free after 180 days, although plate was rough emeried at outset to accelerate possible rusting.

Protect it with **RODOL**

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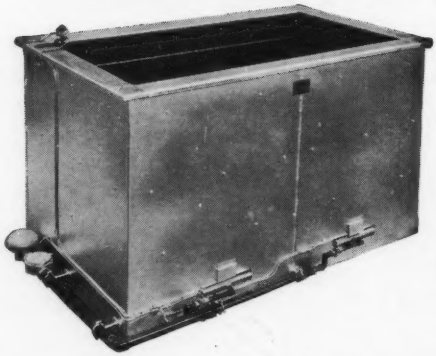

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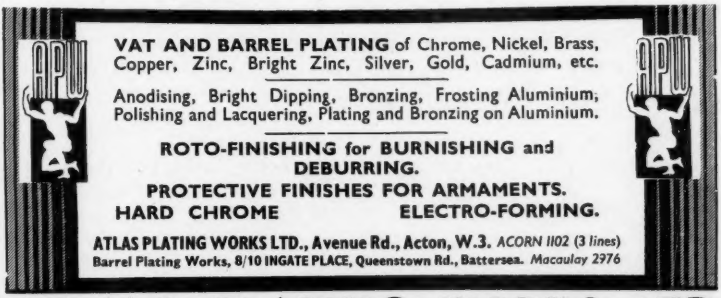
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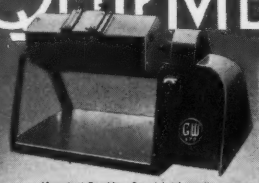

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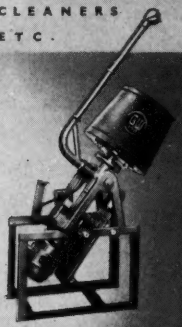

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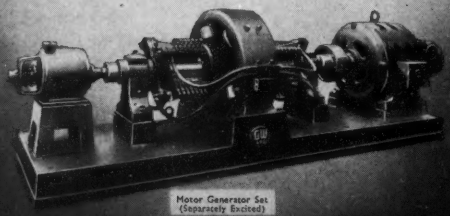

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